Hard Disk Logger

GL1000 SERIES

GL1000-UM-251

SERVICE MANUAL

GL1000-UM-251-02-9370

GRAPHTEC

HISTORY OF REVISIONS

No.	Date issued	Description of revision	Page	Edition
1	06.08.25	First Printing	all	01
2	06.11.16	Part numbers were assigned for main boards and amps.	7-1, 7-2	02

TO ENSURE SAFETY

This Service Manual has been compiled for the purpose of facilitating repair and maintenance of the GL1000 Series Hard Disk Logger by Graphtec service personnel and other persons who have undergone equivalent technical training.

Maintenance or repair by unauthorized service personnel is to be strictly avoided. Because the GL1000 contains numerous internal components with a high electric potential, such work by unauthorized service personnel could cause human injury or serious damage to the recorder.

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1. CONFIGURATION

1.1 Model Configuration

The model number of the GL1000 Hard Disk Logger varies according to the number of channels installed in the main unit, as explained below.

GL1000-8 : 8-channel model
GL1000-16 : 16-channel model
GL1100-8 : 8-channel high-speed voltage model
GL1100-16 : 16-channel high-speed voltage model

1.2 Factory-Installed Options

The following table lists the part numbers of options, which vary according to the type of option and the number of channels installed in the option's compatible main unit.

Table 1-2-1. Factory-installed options

Unit name	Model name	Description
Additional memory for GL1000-8	B-509	Enables memory to be increased to 1 Mword per channel
Additional memory for GL1000-16	B-510	Enables memory to be increased to 1 Mword per channel

1.3 Other Accessories and Options

Unit name	Model name	Description
Voltage amp	GL10-VAMP	2 channels/unit, for GL1000
Voltage/Temperature amp	GL10-MAMP	2 channels/unit, for GL1000
DC Strain amp	GL10-DCBAMP	2 channels/unit, for GL1000
Frequency-to-voltage conversion amp	GL10-FVAMP	2 channels/unit, for GL1000
High-speed voltage amp	GL11-HSVAMP	2 channels/unit, for GL1100
Voltage/Temperature amp	GL11-MAMP	2 channels/unit, for GL1100
DC Strain amp	GL11-DCBAMP	2 channels/unit, for GL1100
Monitor	B-501	8.4 inch color TFT display; connection cable to main unit (approx. 70mm)
12 VDC drive	B-505	DC power cord x1; cables to connect the DC power unit and the main unit x 3
100-mm printer	B-502	Must be connected to the main unit. Chart width is 100 mm, maximum chart speed is 25 mm/s
Monitor cable set	B-506	Cable set for connecting the monitor to the main unit; one 1-m cable, one 22.5-cm cable
Cable to connect main units together	B-508	Length: 140 mm (GL1000 only)
2-pin banana-plug cable	B-378	RIC-115 set of 2 input cables
	B-336	RIC-115 set of 4 input cables
	B-331	RIC-115 set of 8 input cables
	B-335	RIC-115 set of 16 input cables
BNC-BNC cable	RIC-112	1.5 m
BNC-Banana plug cable	RIC-113	1.5 m
BNC-Alligator clip cable	RIC-114	1.5 m
Clamp adapter	CM-102	Measures AC 0 to 1200 A: 1 ch
Digital clamp meter	CM-111	Measures AC/DC current (0 to 2000 A), AC/DC voltage (0 to 1000 V), resistance (0 to 4.000 kΩ), frequency (0 to 4000 Hz), and temperature (-50 to +160˚C)
Line separator	CM-108	x1, x10 : For use with CM-111
Temperature probe for clamp meter	RIC-110	-30 to +200˚C : For use with CM-111
Logic IC cable	RIC-07	To connect RIC-08/09 with logic amp
Alligator-clip cable	RIC-08	For use with logic amp

Unit name	Model name	Description
IC-clip cable	RIC-09	For use with logic amp
Probe set	RIC-10	One each of RIC-07, -08, -09
BNC conversion plugs	SMA-101-4P	Banana to BNC, 4 per set
Chart paper	PR-119	5 rolls/box
Head cleaner set	B-368	Contains cleaning liquid and sheets

2. UPGRADING THE FIRMWARE

The version of your GL1x00's firmware can be upgraded by rewriting the flash ROM on the pertinent circuit boards using a choice of methods. You can upgrade the firmware by loading the update program from either a personal computer via the PC or from a PCMCIA card.

2.1 How to Upgrade the GL1x00 Flash ROM from the PCMCIA Card

Preparations for the upgrade

Firmware :MxxxA001.G10 ← Main Program file for GL1x00
:MxxxA002.G10 ← Main Program file for GL1x00
:SxxxA001.G10 ← Sub Program file for printer

If the optional printer is not connected

(1) Connect the AC adapter for the GL1x00.

(2) Copy the two main program files to PCMCIA card from computer. (Do not copy the sub program and other files to this PCMCIA card.)

If the optional printer is connected

(1) Connect the GL1x00 to the printer.

(2) Connect the AC adapter for the GL1x00.

(3) Connect the AC adapter for the printer.

(4) Copy the two main program files from the computer to a PCMCIA card. (Do not copy the sub program and other files to this PCMCIA card.)

(5) Copy the sub program files from the computer to another PCMCIA card. (Do not copy the main programs and other files to this PCMCIA card.)

How to upgrade

(1) Insert the PCMCIA card containing the main upgrade program into the GL1x00's PCMCIA card slot.

(2) Turn on the GL1x00 to automatically execute the upgrade program.

(3) Wait until the display shown below appears or until the LED goes out.

If the display monitor is installed.
The following message will appear on the GL1x00 display in yellow characters until the upgrade is complete.
"Please Turn Off the Power. I have locked up."

If the display monitor is not installed.
The LED on the left front panel of the GL1x00 will flash during the upgrade.
The LED will go out when the upgrading is complete.
If the upgrading failed the LED will not go out. (will stay lit)

(4) Turn off the power to the GL1x00 when the above message is displayed or when the LED goes out.

(5) If you have the printer option, insert the PCMCIA card containing the sub upgrade program into the GL1x00's PCMCIA card slot.

(6) Turn on the GL1x00 to automatically execute the upgrade program.

(7) Wait until the display shown below appears or until the LED goes out.

If the display monitor is installed.
The following message will appear on the GL1x00 display in yellow characters when the upgrade is complete.
“Please Turn Off the Power. I have locked up.”

If the display monitor is not installed.
The LED on the left front panel of the GL1x00 will flash during the upgrade.
The LED will go out when the upgrading is complete.
If the upgrading failed the LED will not go out. (will stay lit)

(8) Turn off the power to the GL1x00 when the above message is displayed or when the LED goes out.

2.2 How to Upgrade the GL1x00 Flash ROM from the PC

Preparations for the upgrade

If the optional printer is not connected

(1) Connect the AC adapter for the GL1x00.

(2) Connect the LAN cable for the GL1x00 and PC. (If you connect P to P, use a cross LAN cable. If you connect with a hub, use a parallel LAN Cable.)

or

Connect the USB cable for the GL1x00 and PC.

If the optional printer is connected

(1) Connect the GL1x00 to the printer.

(2) Connect the AC adapter for the GL1x00.

(3) Connect the AC adapter for the printer.

(4) Connect the LAN cable for the GL1x00 and the PC.

(If you connect P to P, use a cross LAN cable. If you connect with a hub, use a parallel LAN Cable.)

or

Connect the USB cable for the GL1x00 and PC.

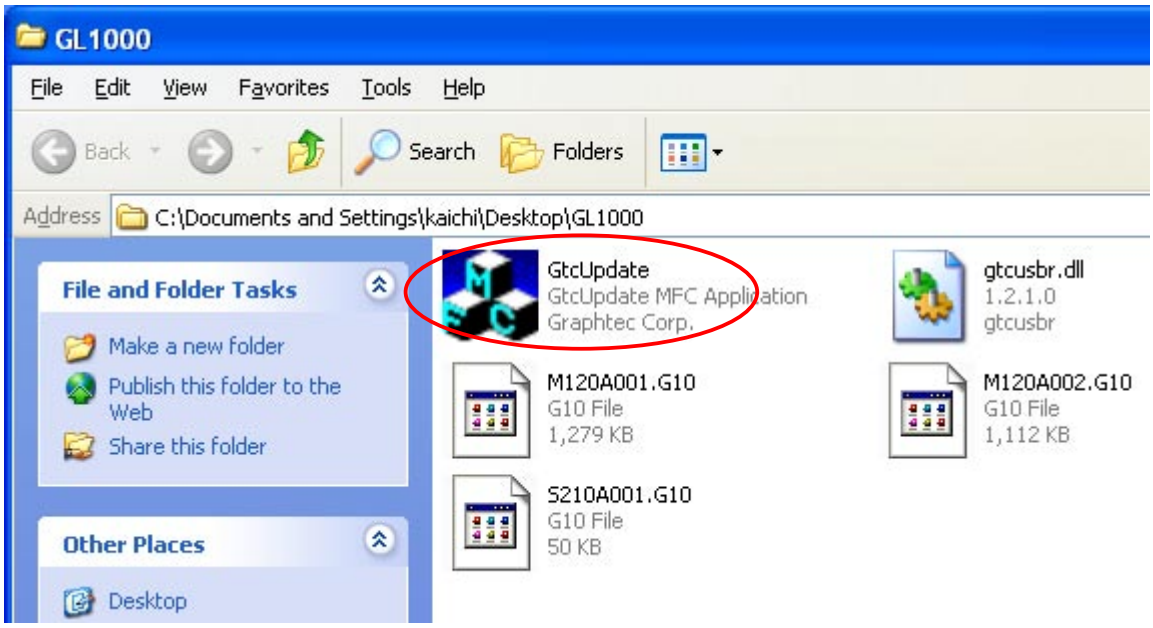
How to upgrade

OS :Windows 2000/XP
Software :GtcUpdate.exe ← Upgrade software file
:Gtcusbr.dll ← Upgrade software dll file
Firmware :MxxxA001.G10 ← Main Program file for GL1x00
:MxxxA002.G10 ← Main Program file for GL1x00
:SxxxA001.G10 ← Sub Program file for printer

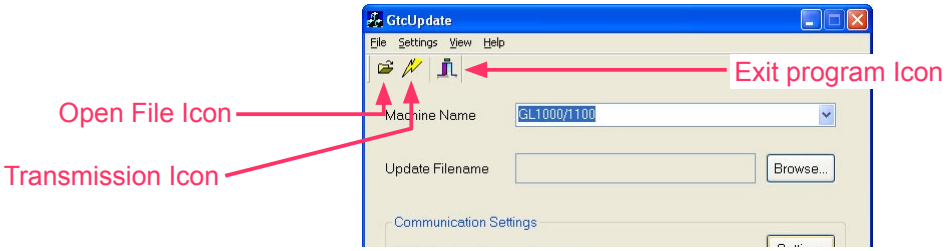
(1) Copy the upgrade software files to the same directory in the PC.

(2) Turn on the power switch of the GL1x00.

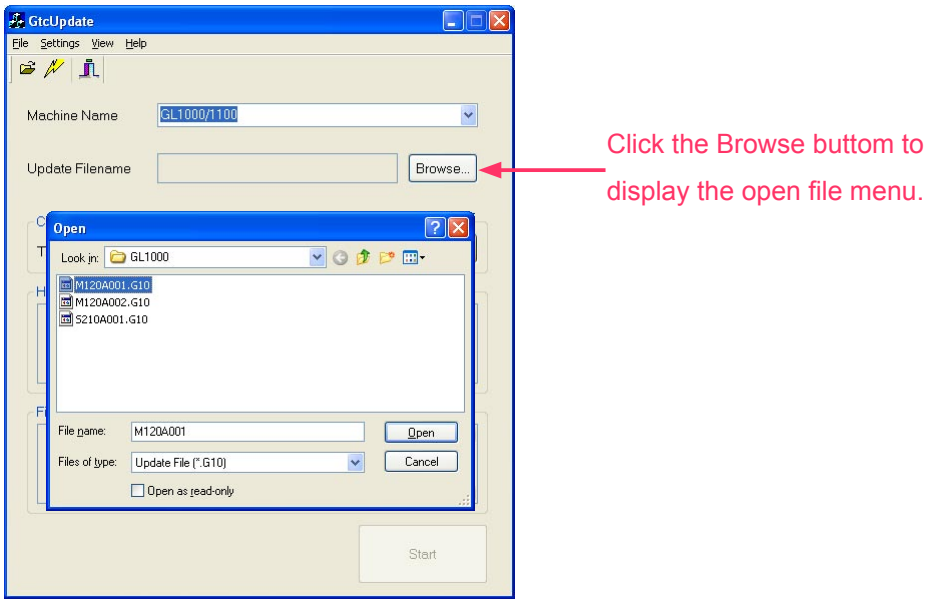
(3) Execute GtcUpdate.exe.



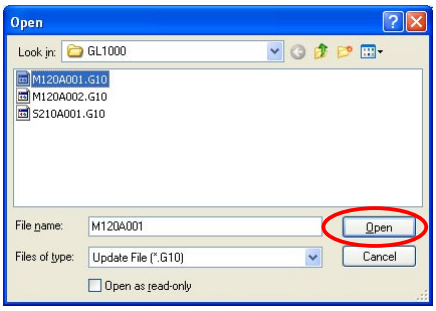
(4) Display the menu as below.



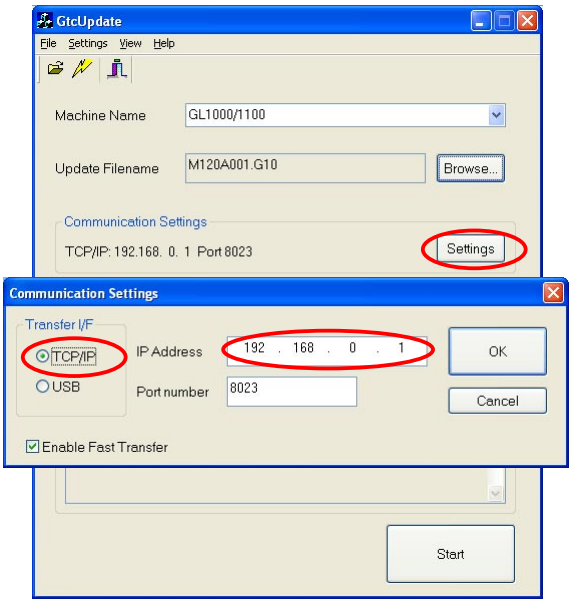
(5) Click the Browse buttom to show the menu as below.



(6) Select the main update file as ”Mxxxa001.G10, and then click the Open Button.



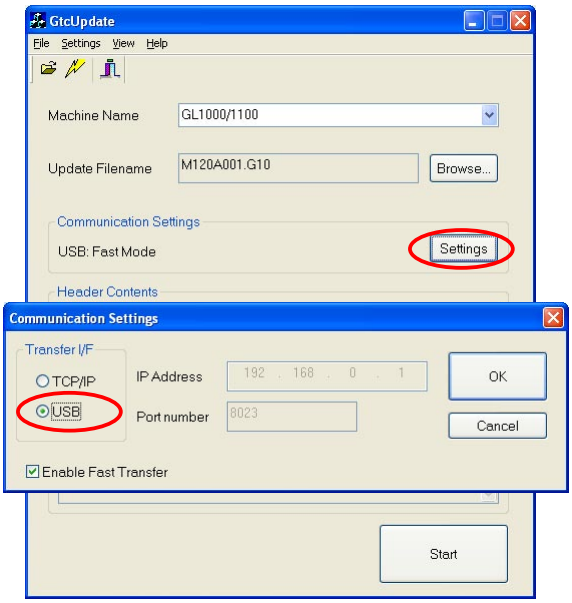
(7) If you connecting to the TCP/IP port, click the transmission settings buttom to set up the TCP/IP conditions.



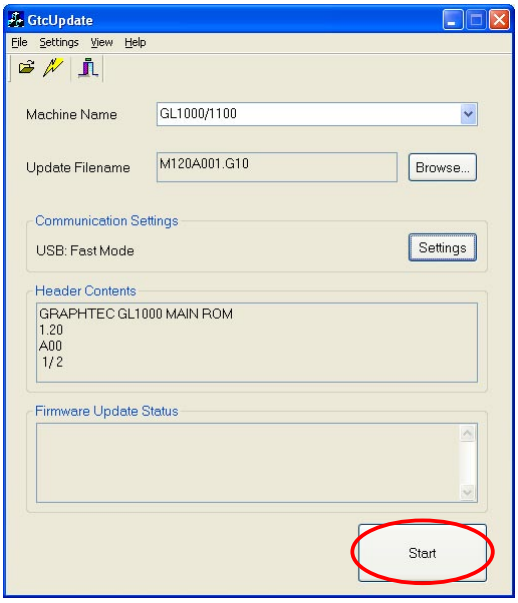
Click the Transfer I/F of TCP/IP to use TCP/IP port.
The default setting for GL1x00 is set to “192.168.0.1”.
If you haven’t changed it, use this setting.
Also, your computer’s TCP/IP port setting must be set to the same segment as “192.168.0.X”.

(7) If you connecting to the USB port, click the transmission settings buttom to set up the USB conditions.

Click the Transfer I/F of TCP/IP to use TCP/IP port.



(8) Click the Start button to start upgrading when you are ready to upgrade.



If the display monitor is installed.

The following message will appear on the GL1x00 display in yellow characters when the upgrade is complete.

“Please Turn Off the Power. I have locked up.”

If the display monitor is not installed.

The LED on the left front panel of the GL1x00 will flash during the upgrade.

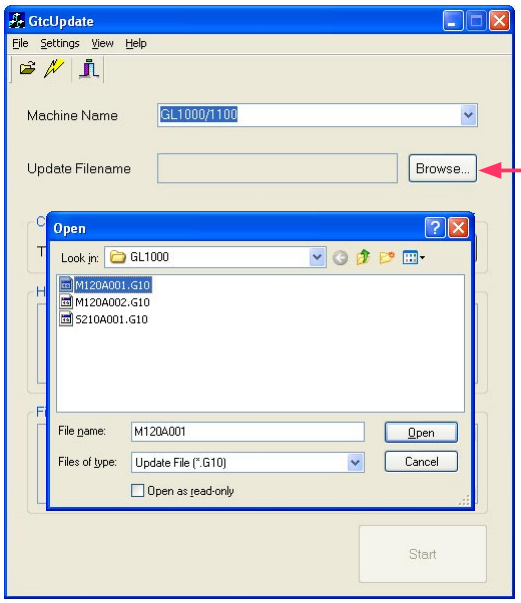
The LED will go out when the upgrading is complete.

If the upgrading failed the LED will not go out. (will stay lit)

(9) Turn off the power to the GL1x00 when the above message is displayed or when the LED goes out.

(10) If you connected the printer, then turn on the power of the GL1x00 again.

(11) Click the Browse buttom to show the menu as below.

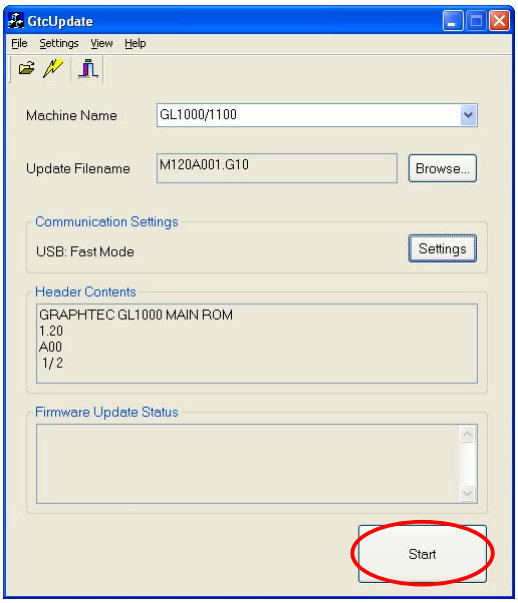


Click the Browse buttom to display the open file menu.

(12) Select the sub update file ”Sxxxa001.G10 to upgrade the printer firmware.

(13) Click the Open Button.

(15) Click the Start button to start upgrading when you are ready to upgrade.



If the display monitor is installed.

The following message will appear on the GL1x00 display in yellow characters when the upgrade is complete.

“Please Turn Off the Power. I have locked up.”

If the display monitor is not installed.

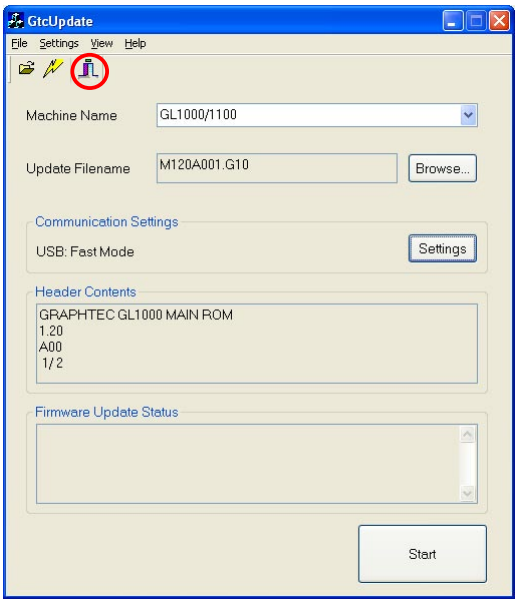
The LED on the left front panel of the GL1x00 will flash during the upgrade.

The LED will go out when the upgrading is complete.

If the upgrading failed, the LED will not go out. (will stay lit)

(16) Turn off the power to the GL1x00 when the above message is displayed or when the LED goes out.

(17) Click the Exit icon to exit this upgrade program.



3. DISASSEMBLY AND REASSEMBLY

3.1 Notes on Disassembly and Reassembly

- During disassembly, disconnect the cables from the specified connectors as necessary.
- During reassembly, double-check to ensure that the proper cables have been correctly re-connected to the pertinent connectors.
- Some areas of the control panel unit possess a high electrical potential, so exercise caution to avoid an electrical shock.
- When handling the LCD shield and LCD protective plate, be careful not to leave fingerprints or other marks on them.

3.2 Installing or Removing an Amp

This section describes how to install an analog amplifier and a logic amplifier.
The amplifiers can be removed using the reverse procedure. Grasp the panel section of the amplifiers when removing.

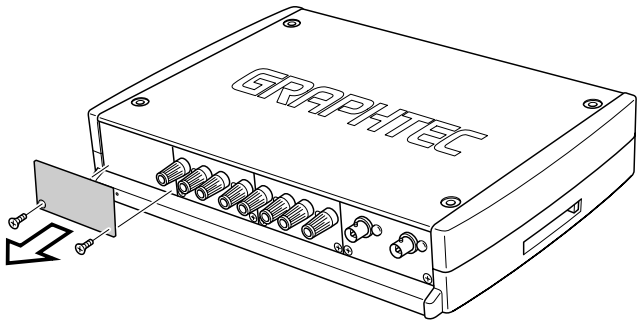
<GL1x00 unit front> : Analog amplifiers are installed here.
<GL1x00 unit rear> : The logic amplifier is installed here.

CHECKPOINT

- Always turn off the power before installing or removing the amplifiers.
- Adequate precautions against static electricity must be taken when handling the amplifiers.
- Do not alter the adjustment knobs next to the V amplifier input terminals (GL1000).

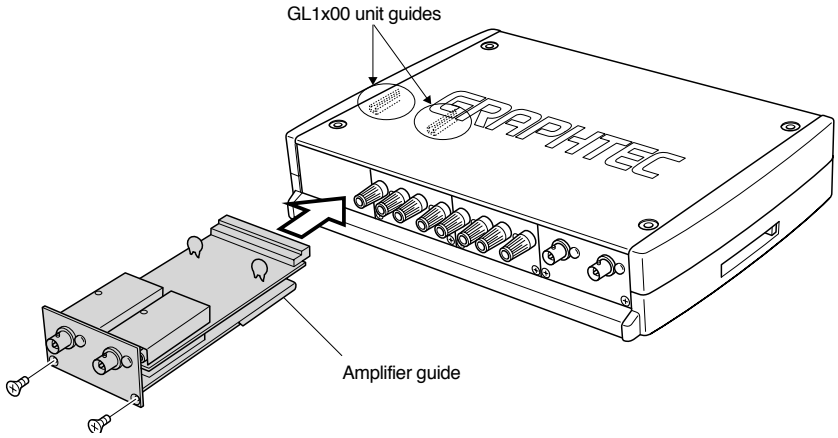
3.2.1 Amplifier Installation Procedure

(1) Remove the amplifier slot cover retaining screws and remove the amplifier slot cover.

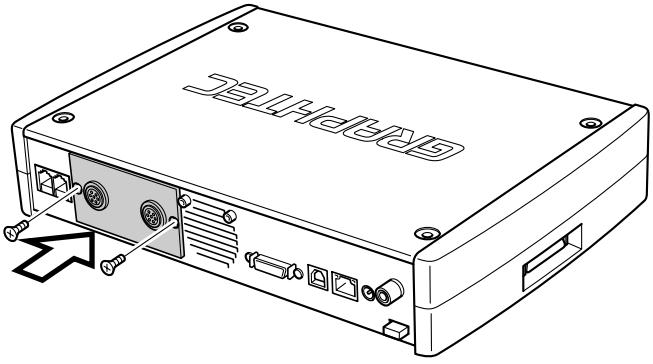


(2) Install the appropriate amplifier for your measurement requirements. Align the amplifier guides with the guides inside the GL1x00 unit when performing installation.

Analog amplifier (front of GL1x00 unit)



Logic amplifier (rear of GL1x00 unit)



(3) After installing the amplifier, secure it using the amplifier setscrews. Use the countersunk screws provided with the amplifier.

CHECKPOINT

Tighten the amplifier set screws to a torque of 5 kgfcm. Excessive tightening will damage the screws.

(4) Repeat steps (1) to (3) for the slots required.

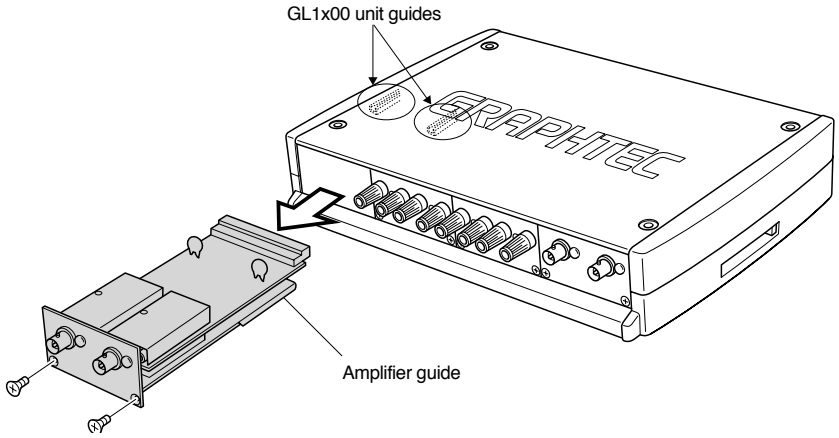
CHECKPOINT

Always fit the amplifier slot covers provided over those channels not used.
Amplifier slot covers are available as separate accessories. Contact your sales representative or nearest Graphtec vendor.
When using one amplifier with the 16-channel type, insert the amplifier in the slot in the top unit.
The GL1x00 may not operate to the specified performance if the amplifier slot covers are not fitted.

3.2.2 Amplifier Removal Procedure

(1) To remove an amplifier, unfasten two screws at the amplifier, then grasp the amplifier to pull it out toward you.

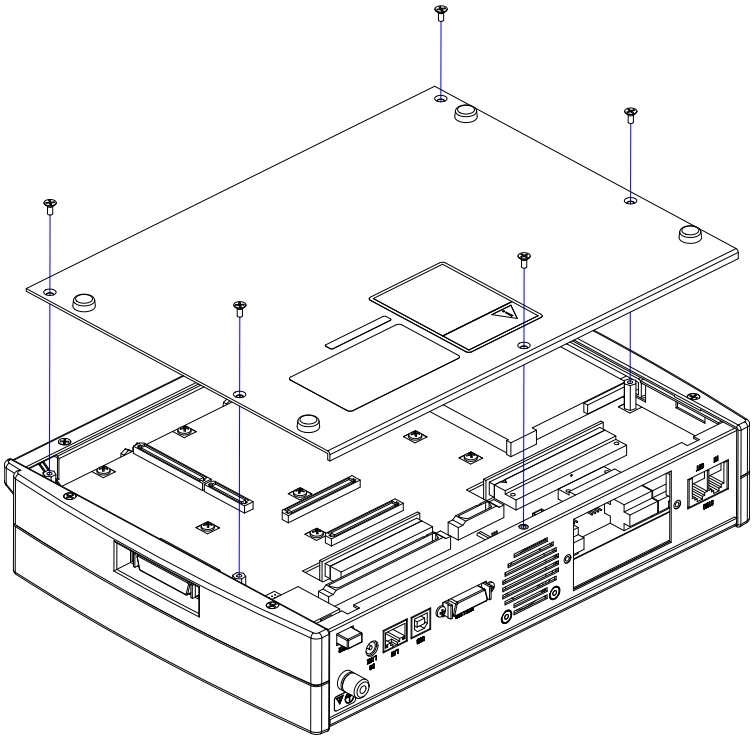
Analog amplifier (front of GL1x00 unit)



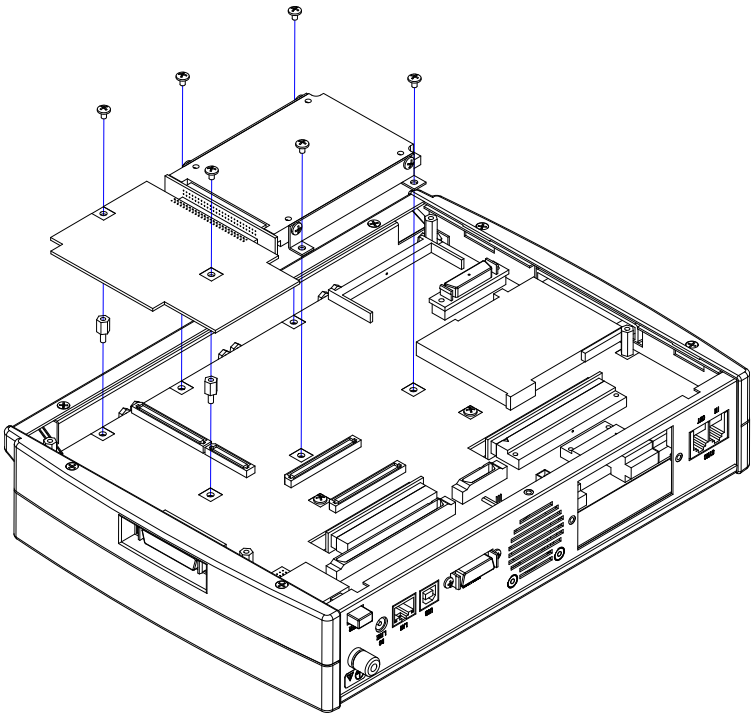
3.3 Replacement and adjustment of the hard disk drive unit

3.3.1 Replacement procedure in the case of an 8-channel model

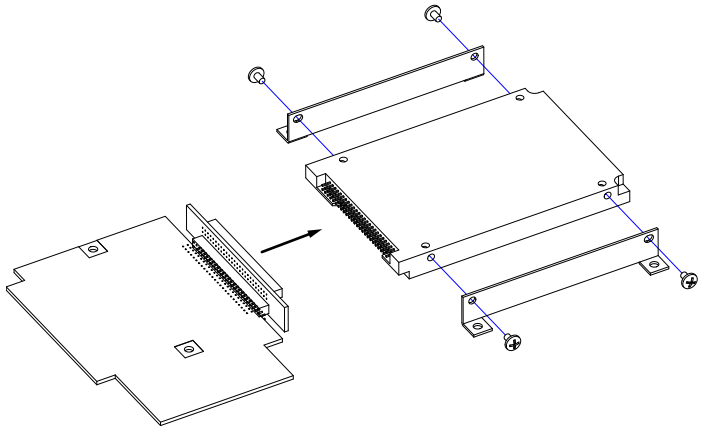
(1) Remove the 5 x flathead screws from the bottom plate, then remove the bottom plate.



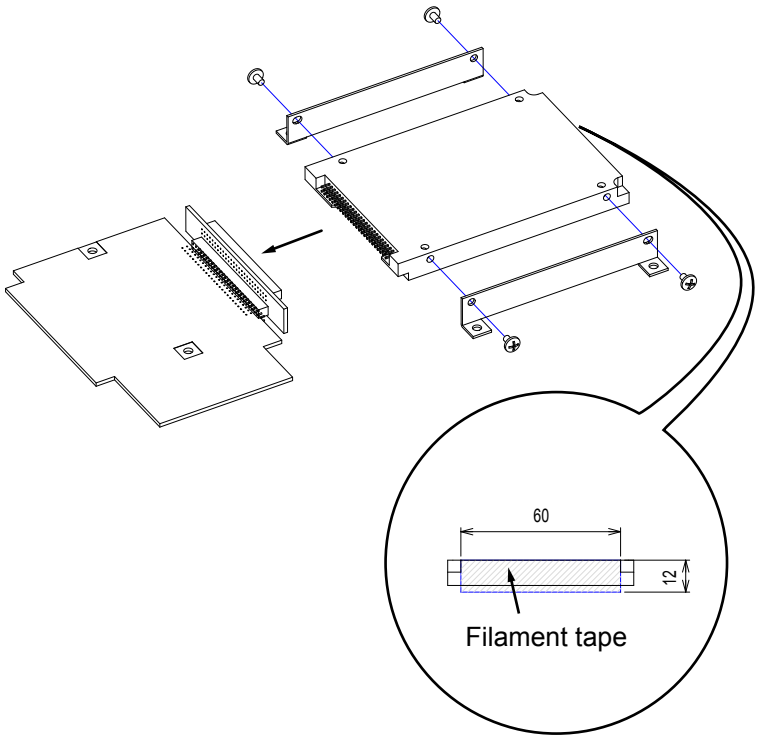
(2) Remove the hard disk dive unit and the hard disk drive control board.



(3) Remove the hard disk drive unit from the hard disk drive connecting plate on the hard disk drive control board.

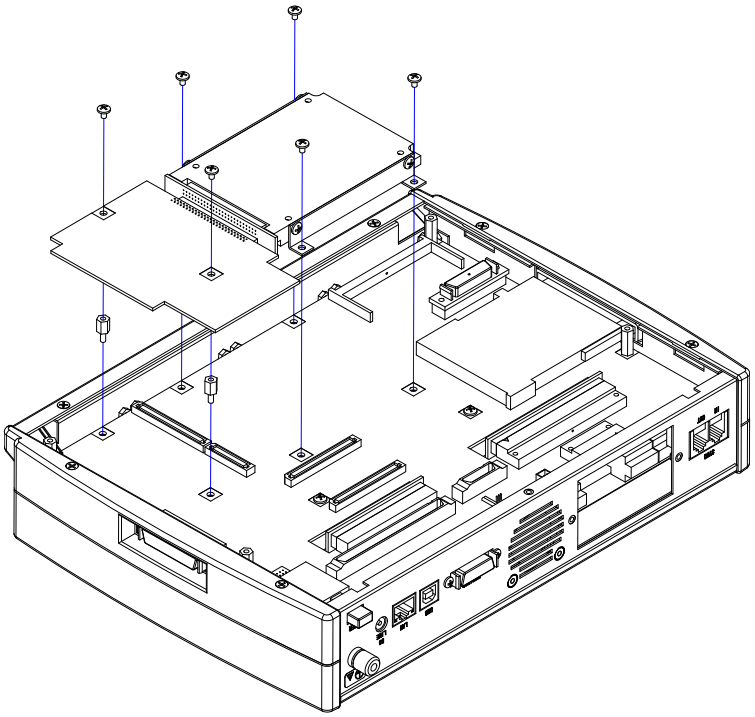


(4) Remove the hard disk drive mounting brackets at both ends of the hard disk drive unit.
(5) Apply the filament tape on the rear side of the new hard disk drive unit.

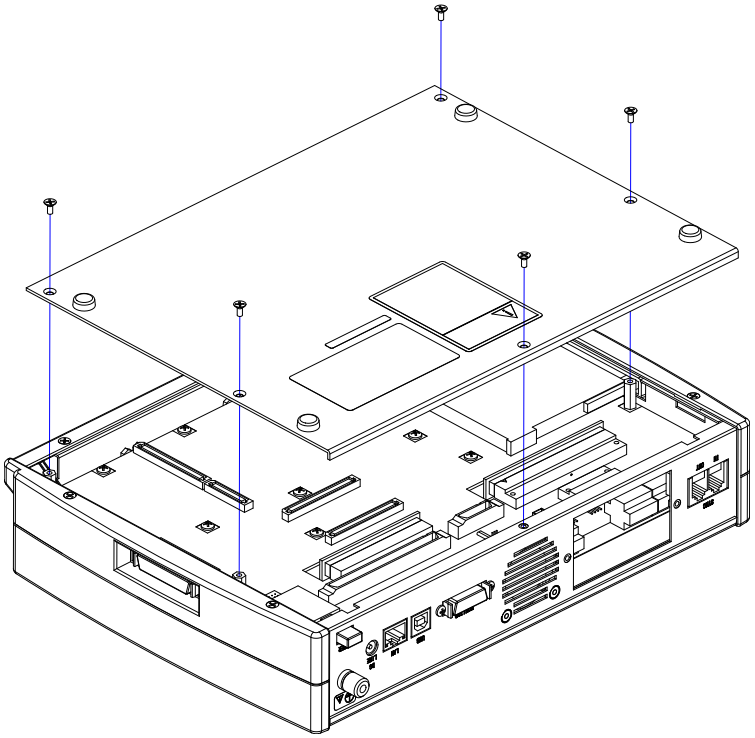


(6) Mount the brackets which were removed at step (4) above on both sides of the new hard disk drive unit.
(7) Insert the hard disk drive unit into the hard disk drive connecting plate, then connect the hard disk drive unit and the hard disk drive control board.

(8) Mount the connected hard disk drive unit on the main unit.

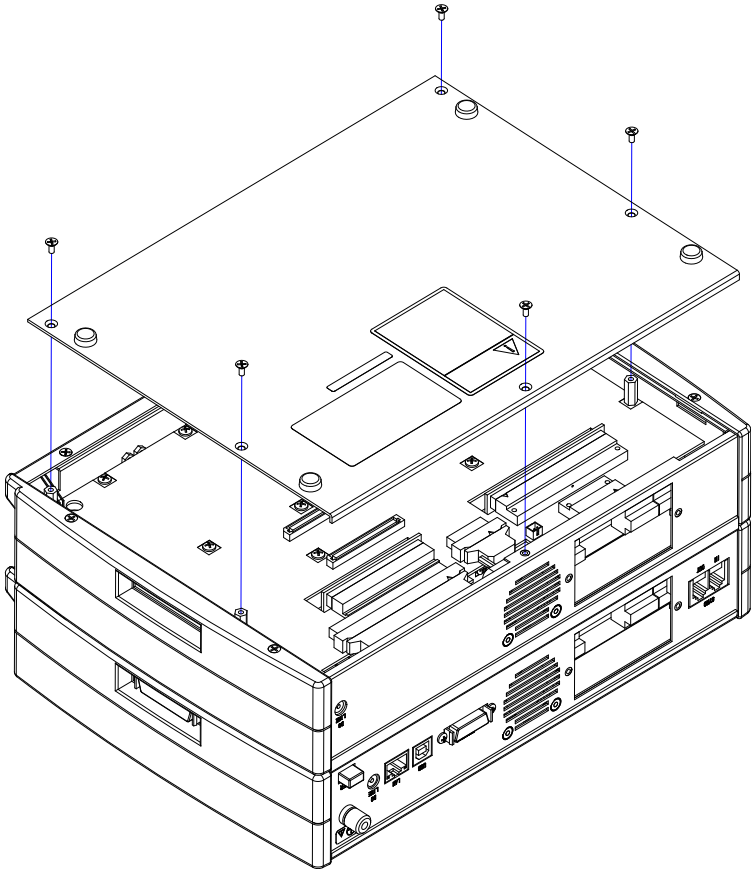


(9) Mount the bottom plate.



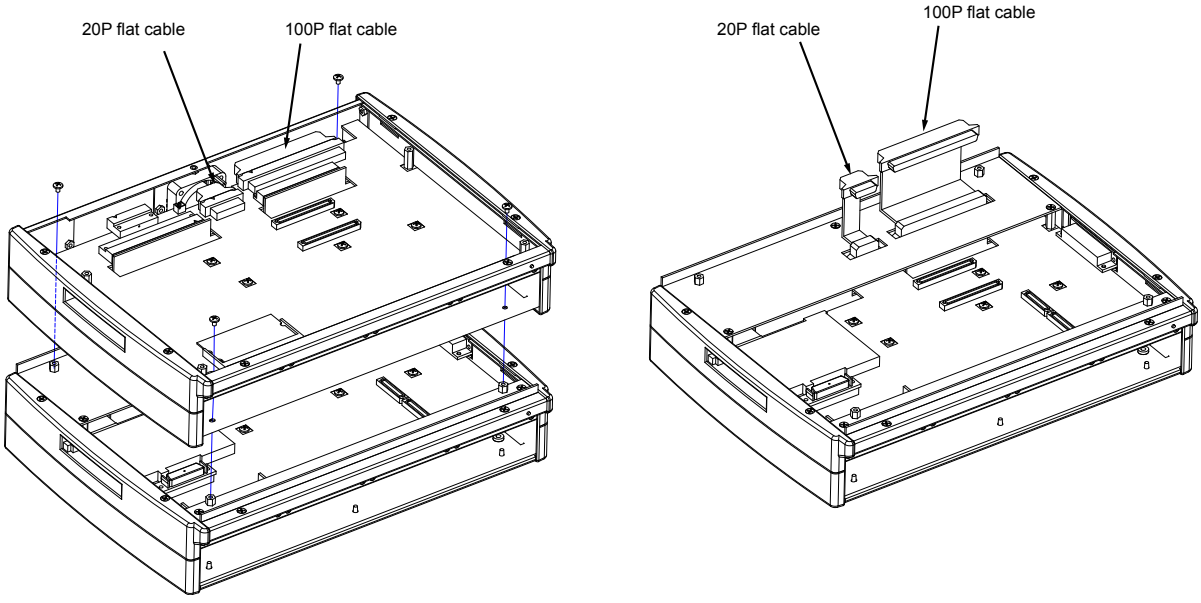
3.3.2 Replacement procedure in the case of a 16-channel model

(1) Remove the 5 x flathead screws from the bottom plate, then remove the bottom plate.



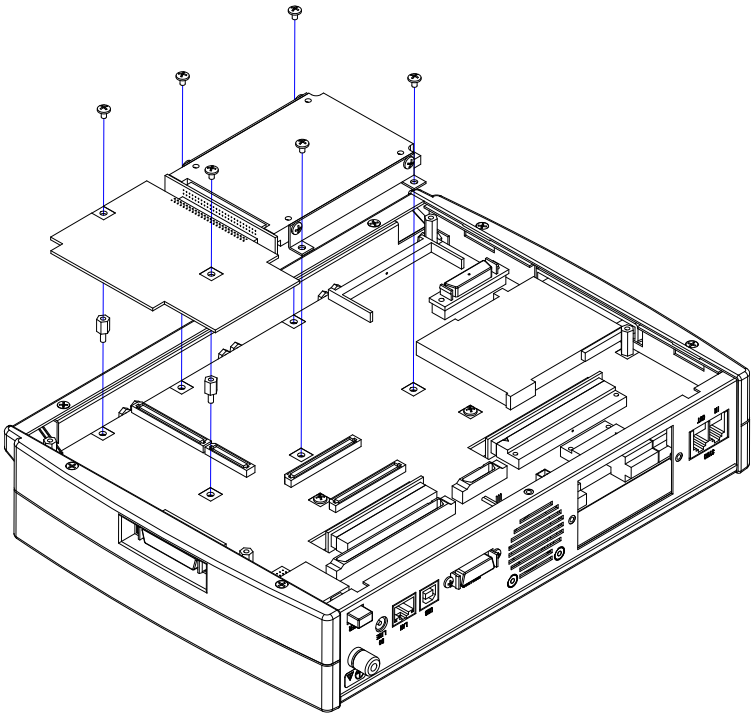
(2) Remove the flat cables (100P and 20P) which connect the main board at the 16ch unit side.

(3) Remove the amplifiers at the 8ch unit side.

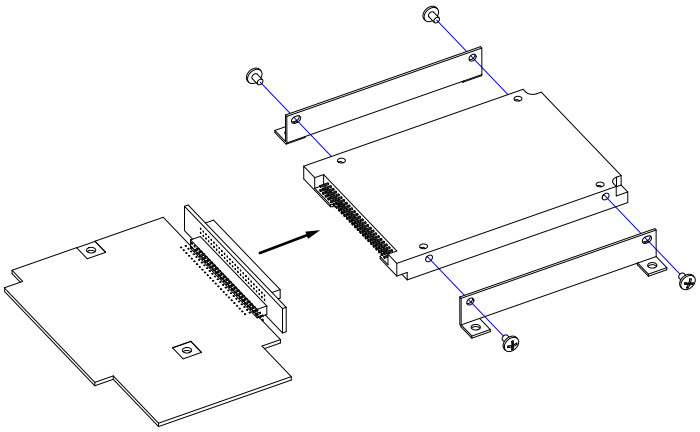


(4) Remove the 4 x bindhead screws, then separate the 16ch unit and the 8ch unit.

(5) Remove the hard disk drive unit and the hard disk drive control board.

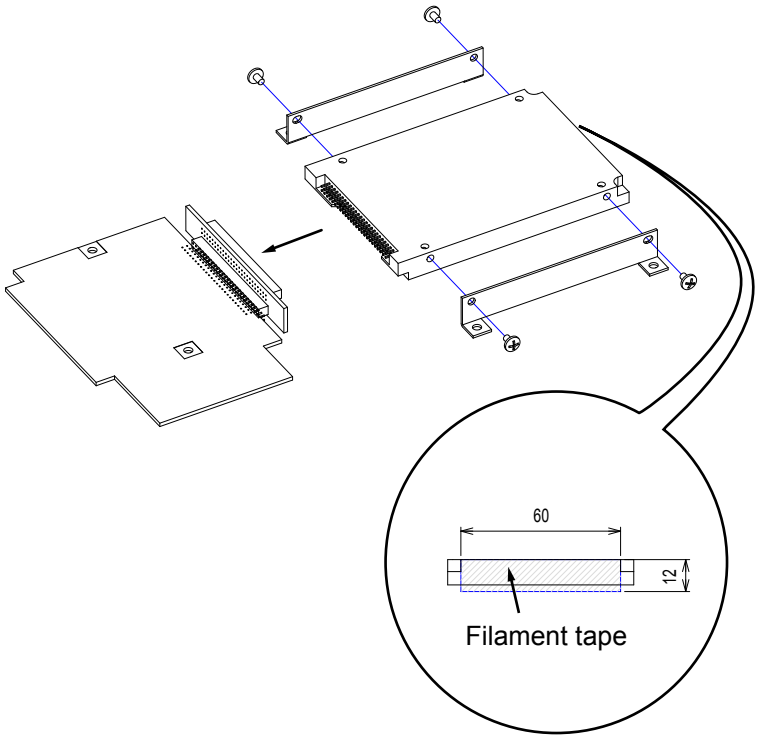


(6) Remove the hard disk drive unit from the hard disk drive connecting plate on the hard disk drive control board.



(7) Remove the hard disk drive mounting brackets at both ends of the hard disk drive unit.

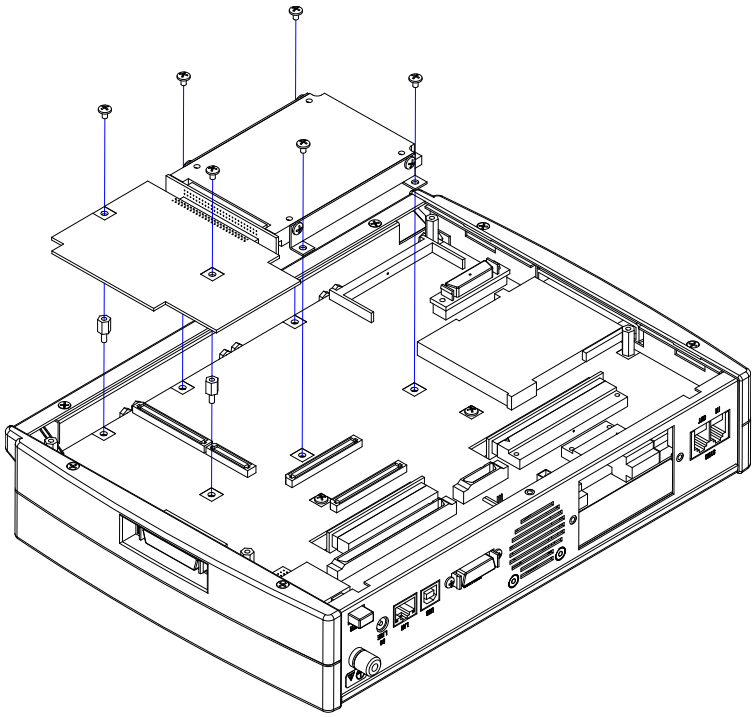
(8) Apply the filament tape on the rear side of the new hard disk drive unit.



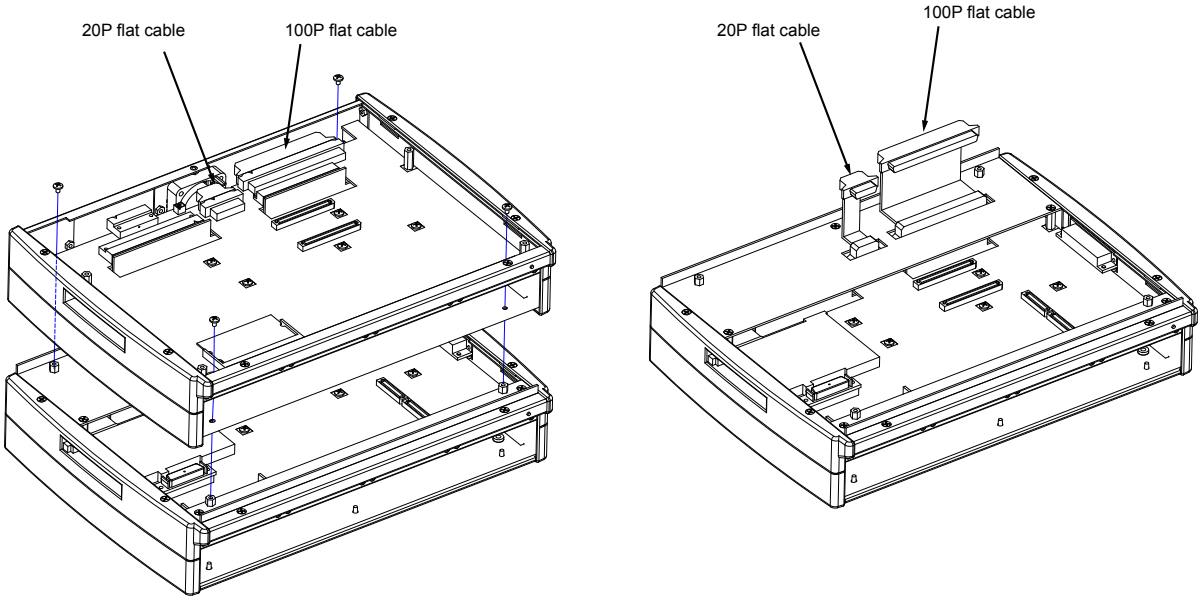
(9) Mount the brackets which were removed in step (6) above on both sides of the new hard disk drive unit.

(10) Insert the hard disk drive unit into the hard disk drive connecting plate, then connect the hard disk drive unit and the hard disk drive control board.

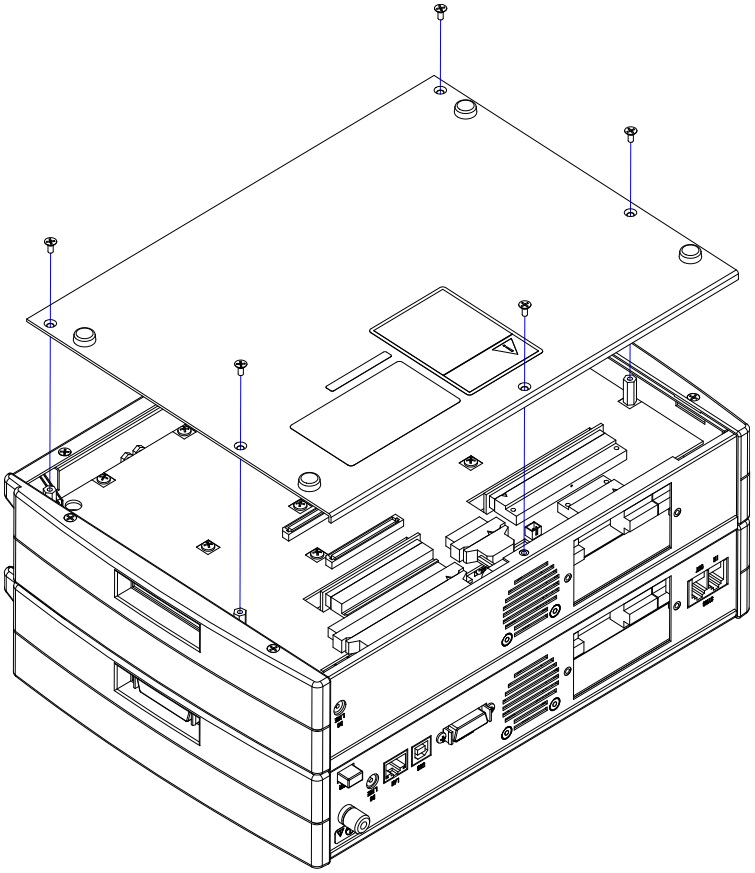
(12) Mount the connected hard disk drive unit on the main unit.



(13) Connect the 8ch unit and the 16ch unit.
Insert the flat cables (100P and 20P) on the 16ch unit side which connect the main board into the connectors on the 16ch unit.
At this stage, keep 2.5 mm of open space between the flat cable (20P) and the fan.



(14) Connect the 8ch unit and the 16ch unit, then secure with the screws.



3.3.3 Initializing and Checking the HDD

A newly-installed HDD is not formatted.

Initialize the HDD using the procedure described below.

(1) While holding down the LOCAL and EXECUTE keys, turn on the power. Then the HDD format message appears on the display.

(2) The following message is displayed.

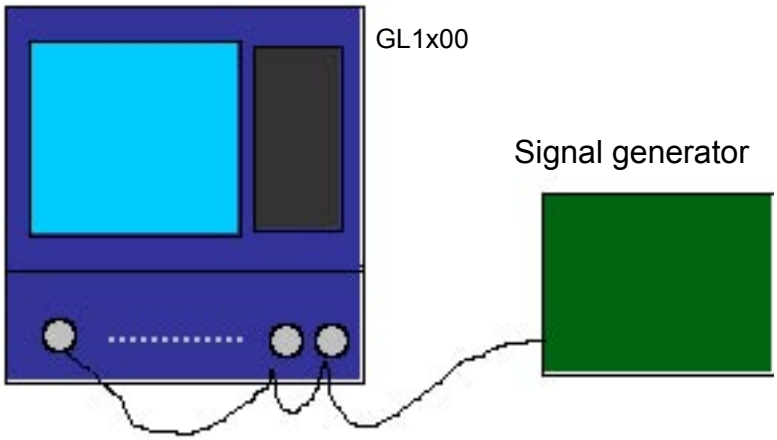
Initializing Disk System.
Detected HDD Initialize Key.
Press START Key To Start HDD Init
ialize.
Press CANCEL Key TO Cancel Operat

(3) Press the START/STOP key.

(4) Formatting of the HDD is started. Then the initializing message appears for 2 to 3 seconds.

(5) After formatting is completed, the display returns to the initial menu.

Preparations for the check operation



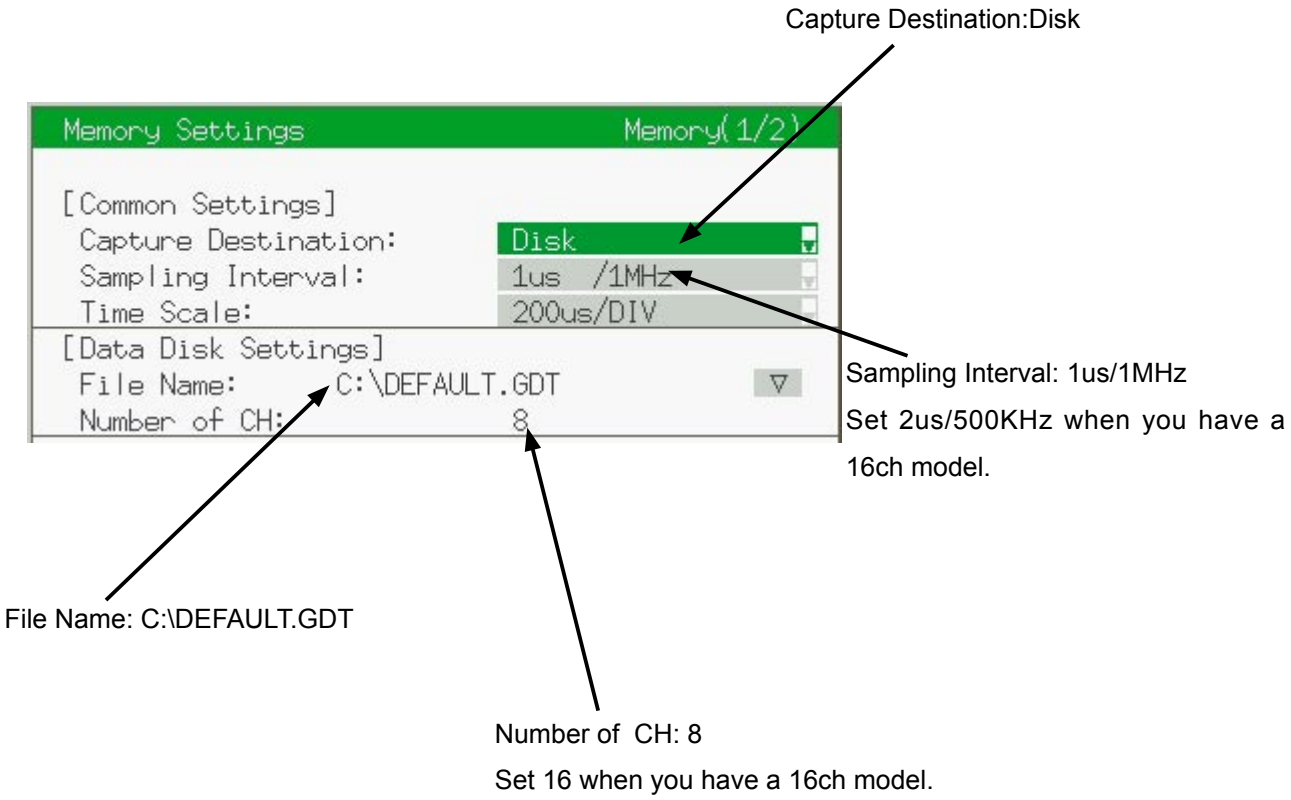
Connect the signal generator to the amplifier.

Checking method

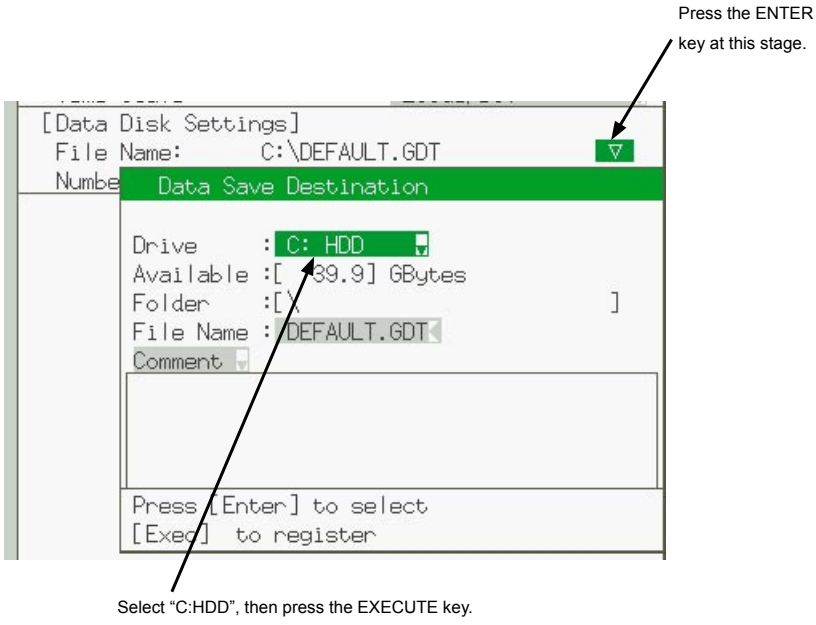
(1) Press the MEMORY key to display the menu shown below.

(2) Set each setting condition as follows.

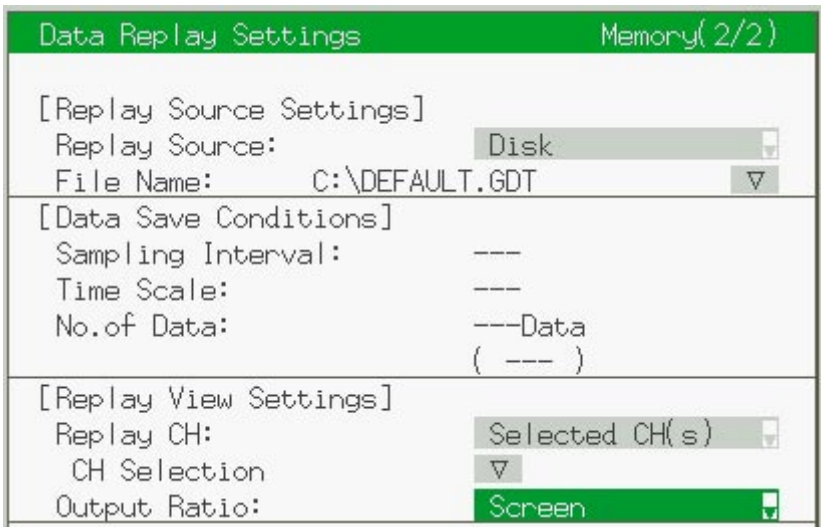
Capture Destination : Disk
Sampling interval : 1 micro second/1MHz (in case of 16ch model, 2 micro seconds/500kHz)
File Name : C:\DEFAULT.GD
Number of CH : 8 (in the case of a 16ch model: 16)



(3) If the capture destination is not set to the C drive, change it at the following menu.



(4) Press the MEMORY key, and then make the data replay settings as shown below.



(5) Press the INPUT key, then set the following.

Type of Amp.	Input	Range	Filter	Span
V	DC	5V	50Hz	+2.5V to -2.5V
M	DC	5V	50Hz	+2.5V to -2.5V
DCB	DC	20m	100Hz	+10m to -10mV
HSV	DC	5V (500 mmV/DIV)	50Hz	+2.5V to -2.5V

In the case of a DCB amplifier, the input voltage is different than for other types of amplifiers. Therefore you need to check each DCB amplifier individually.

(6) Press the RECORD key, then set the trigger settings as shown below.

Common settings

Function :Memory

Time Gate :Disable

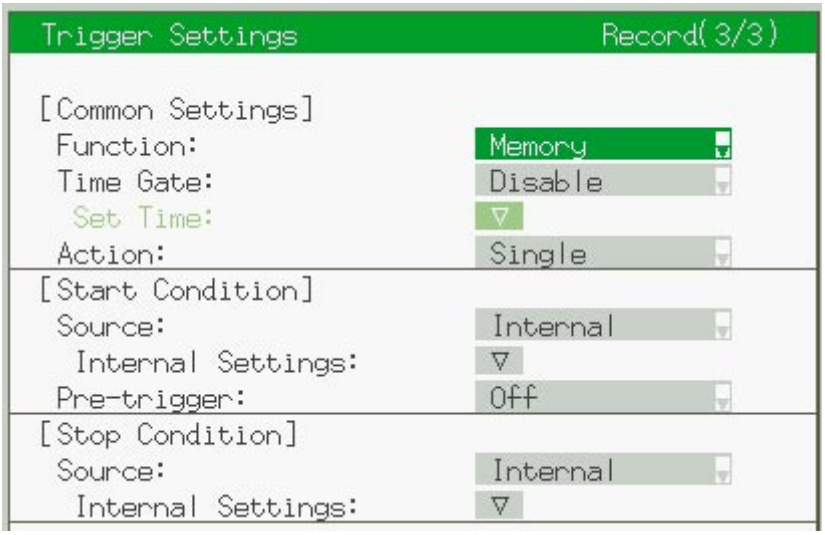
Start Condition

Source :Internal

Pre-trigger :Off

Stop Condition

Source :Internal



(7) Make the Start Condition settings as shown below.

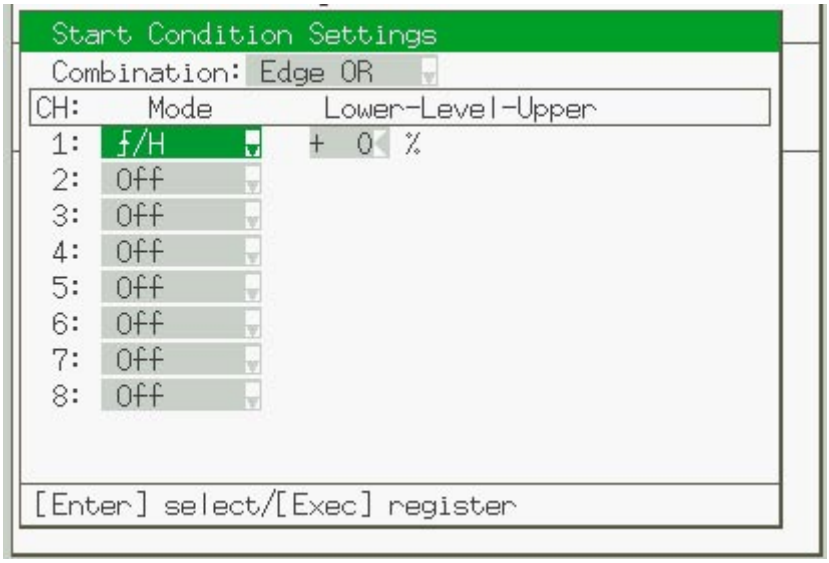
Start Condition settings

Combination :Edge OR

CH :

Level :+0%

Mode :Up H



This setting condition is required only for the amplifiers for which the input is set to “DC”.

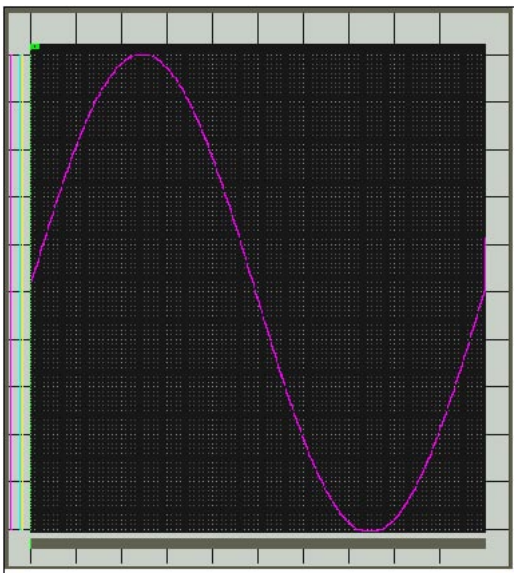
(8) Set the output of the signal generator as shown below.

Type of Amp.	Generator		
	AMPTD	FREQ	FUNC
V	5V P-P	10 Hz	Sine wave
M	5V P-P		
DCB	20mV P-P		
HSV	5V P-P		

(9) Press the START/STOP key to start measurement.
Wait until the data capture is finished.

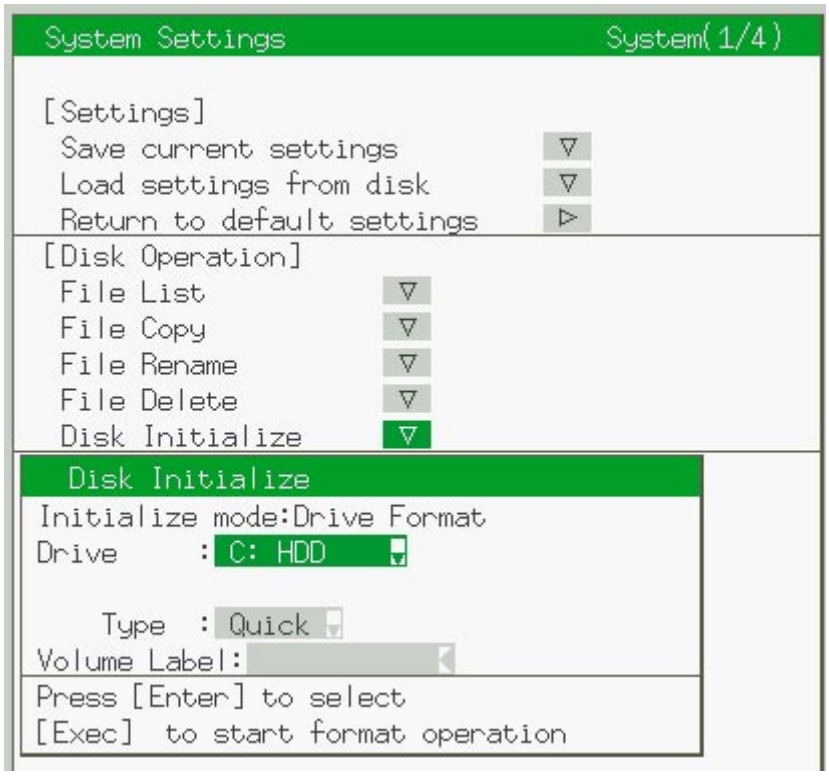
(10) Press the START/STOP key to stop measurement.

(11) Press the REPLAY/EXECUTE key to output the waveform.
Confirm that the waveform shown below appears.



(12) Check the waveform channel by channel using the procedure described in step (10).
(13) Press the MEMORY key 2 times to change the Replay View Settings in the Data Replay setting menu.

(14) Press the ENTER key at the channel setting to display the channel setting menu.
(15) Turn on only the channels which need to be checked.
(16) Press the EXECUTE key to confirm.
(17) Press the REPLAY/EXECUTE key to display the waveform, then check it.
(18) Repeat the above steps (10) to (16) for all channels for which amplifiers are mounted.
(19) When the HDD check has been completed, delete the data which is stored on the HDD using the following procedure.
(20) Press the SYSTEM key to display the System Settings menu, then select Disk Initialize. Press the ENTER key to display the following window.



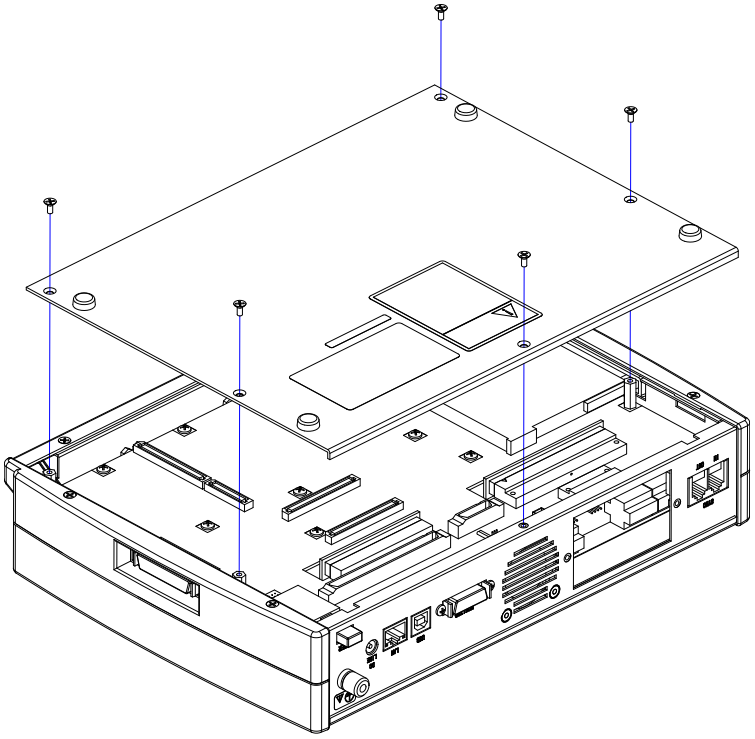
(21) Set the drive to “C:HDD”.
(22) Set the type to “Quick”.
(23) Press the EXECUTE key to start the formatting operation.

3.4 Memory replacement and checking procedure

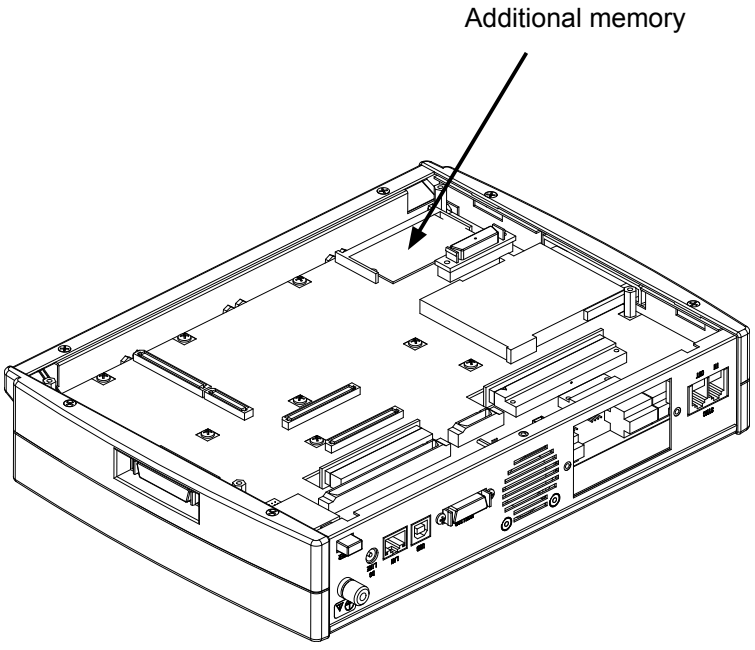
3.4.1 Memory replacement procedure

In the case of an 8-channel model

(1) Remove the 5 x flathead screws from the bottom plate, then remove the bottom plate.



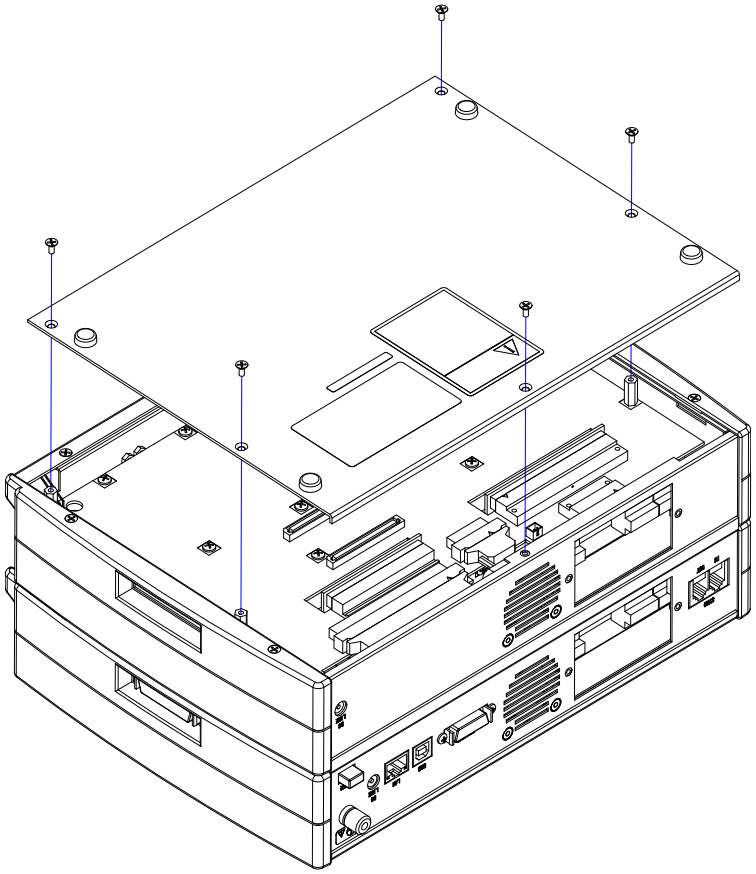
(2) Remove the memory which is mounted at the following location



(3) Mount the bottom plate.

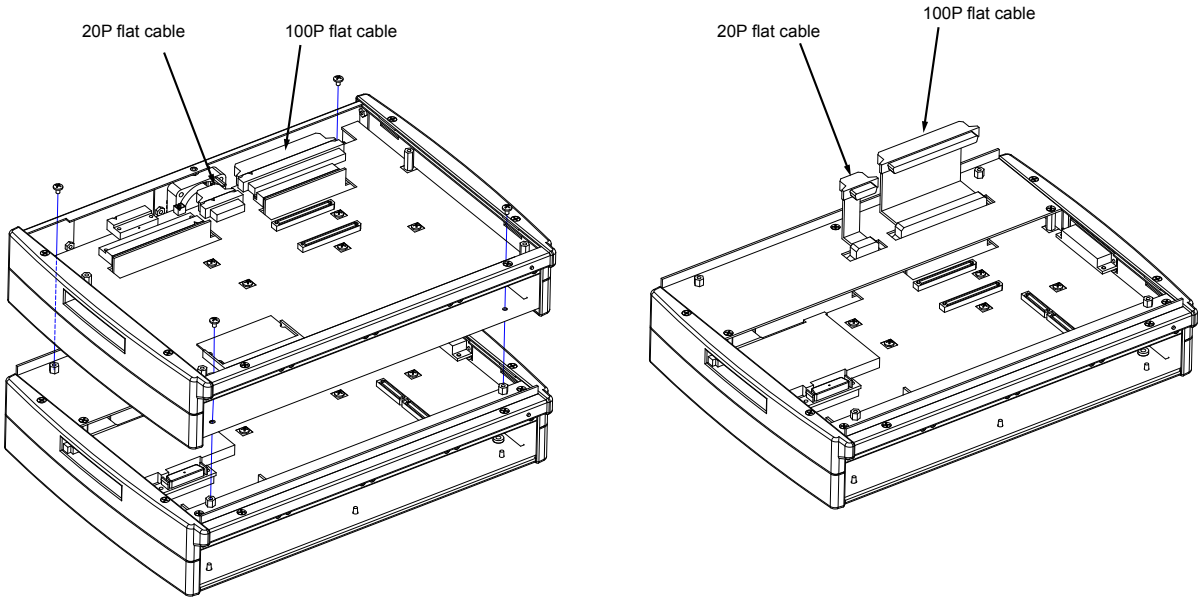
In the case of a 16-channel model

(1) Remove the 5 x flathead screws from the bottom plate, then remove the bottom plate.



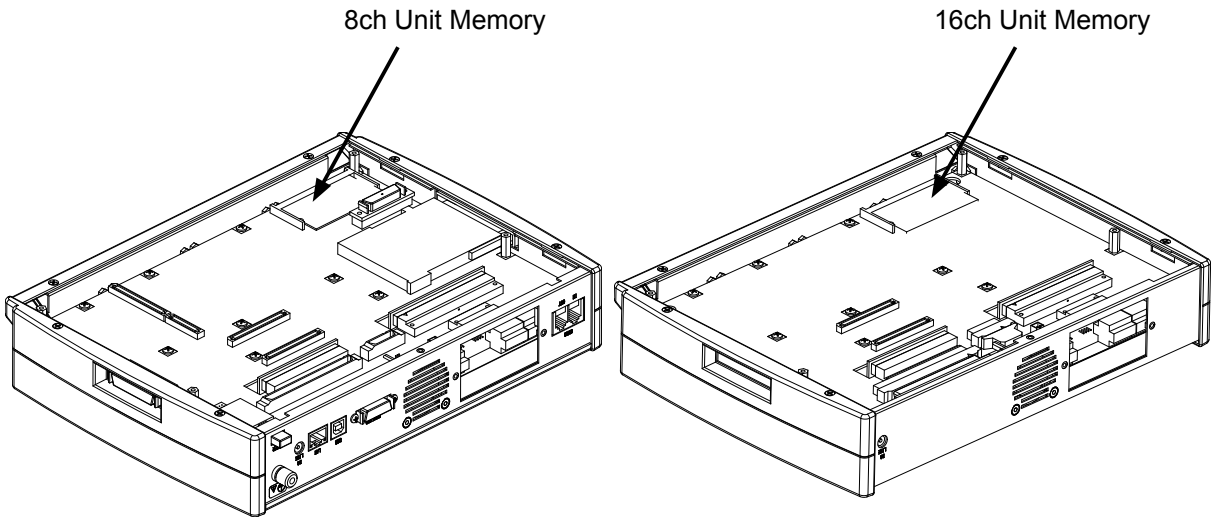
(2) Remove the flat cables (100P and 20P) which connect the main board at the 16ch unit side.

(3) Remove the amplifiers at the 8ch unit side.

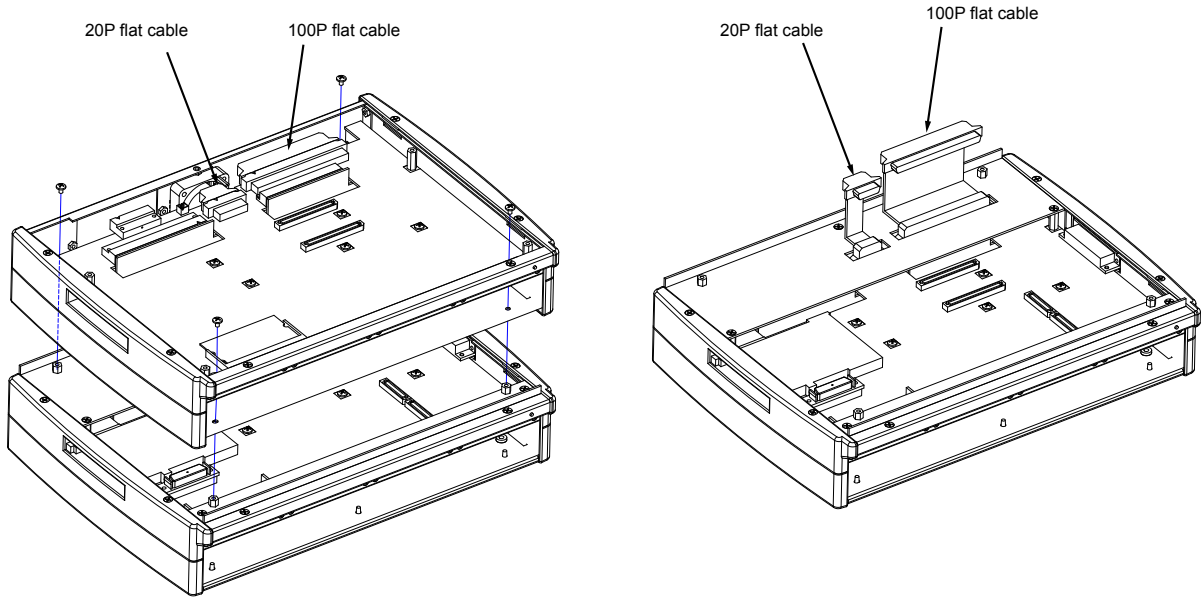


(4) Remove the 4 x bindhead screws, then separate the 16ch unit and the 8ch unit.

(5) Remove the memory which is mounted at the following location.



(6) Connect the 8ch unit and the 16ch unit.
Insert the flat cables (100P and 20P) on the 16ch unit side which connect the main board into the connectors on the 16ch unit.
At this stage, keep 2.5 mm of open space between the flat cable (20P) and the fan.

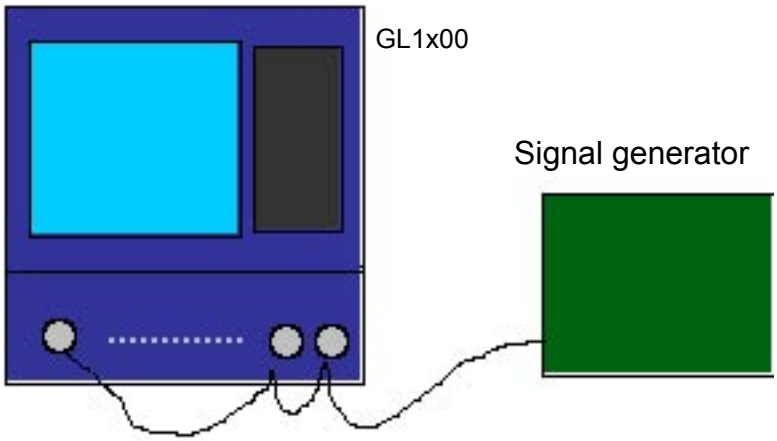


(7) Connect the 8ch unit and the 16ch unit, then secure with the screws.

(8) Mount the bottom plate.

3.4.2 Memory checking procedure

Preparations for the check operation



(1) Connect the signal generator to the amplifier.

(2) Set the output of the signal generator as shown below.

Type of Amp.	Signal Generator		
	AMPTD	FREQ	FUNC
V	5V P-P	2 Hz (1 Hz when the Option memory installed)	Sine wave
M	5V P-P		
DCB	20mV P-P		
HSV	5V P-P	20 kHz	
FV	10V P-P	0 to 1 kHz	Triangle

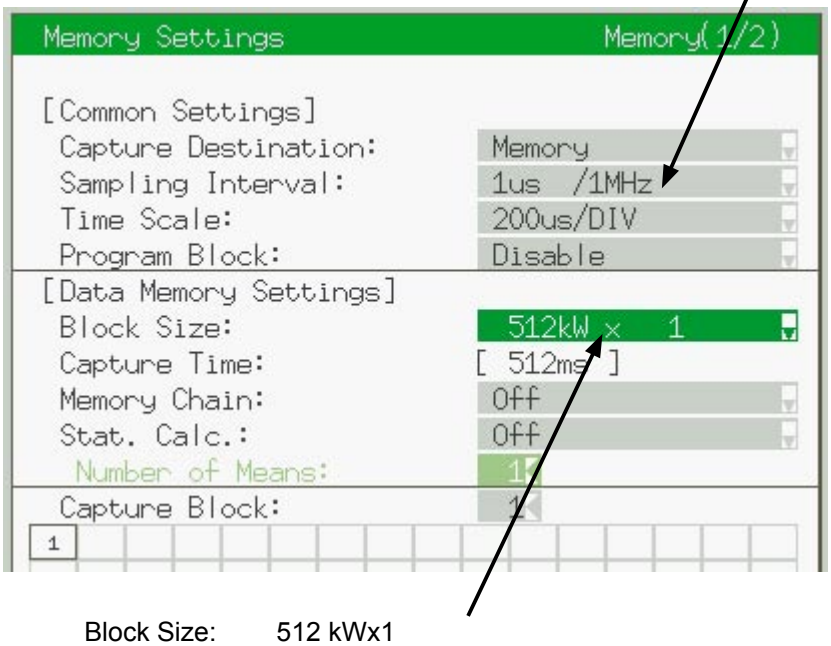
Checking method

(1) Press the INPUT key, then set the following for each amplifier.

Type of Amp	INPUT	RANGE	FILTER
V	DC	5 V	50 Hz
M	DC	5 V	50 Hz
DCB	DC	20 m	30 Hz
HSV	DC	5 V (500 mV/DIV)	5 kHZ
FV	DC	1 kHz	OFF

(2) Press the MEMORY key, then set the Memory Settings as follows.

Sampling Interval: 1us
(Set 50 ns when you have the HSV amp.)

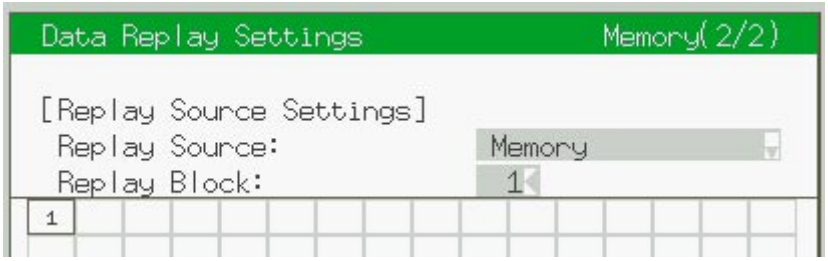


Block Size: 512 kWx1

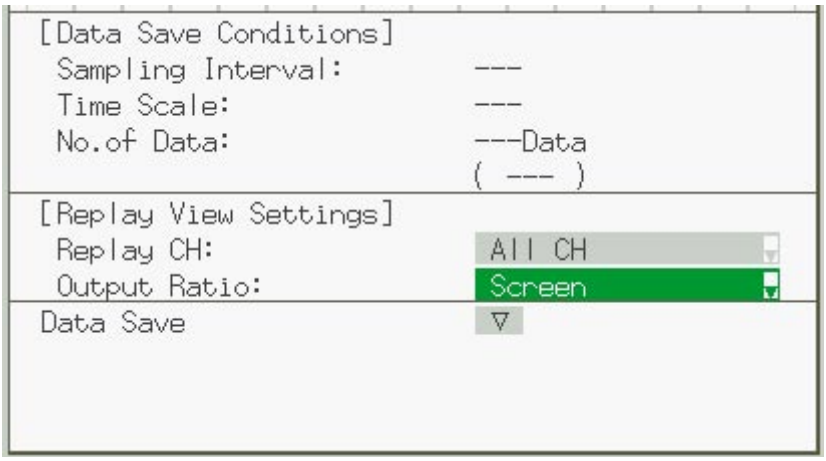
Block Size: 1 MWx1 (When option memory is installed)

Block Size: 2048 kWx1 (When the HSV amp is installed)

(3) Press the MEMORY key, then set the Data Replay Settings as follows.

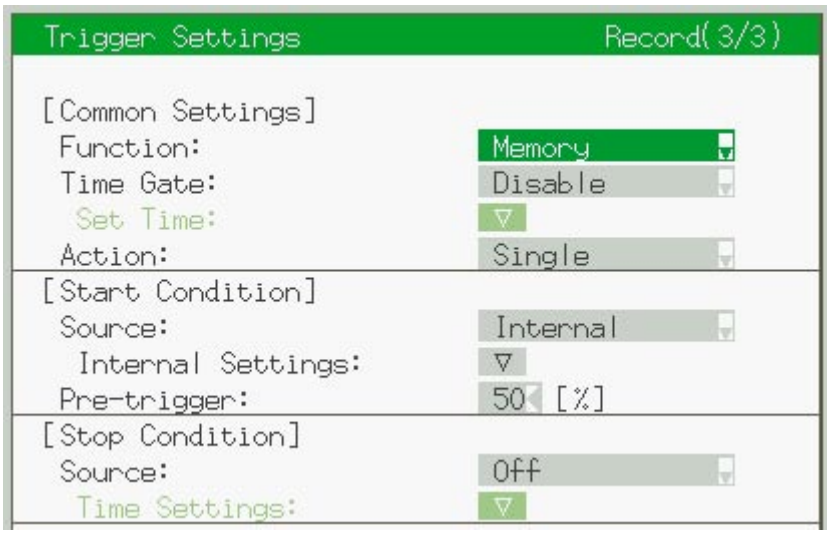


(4) Set the Output Ratio to “Screen”.



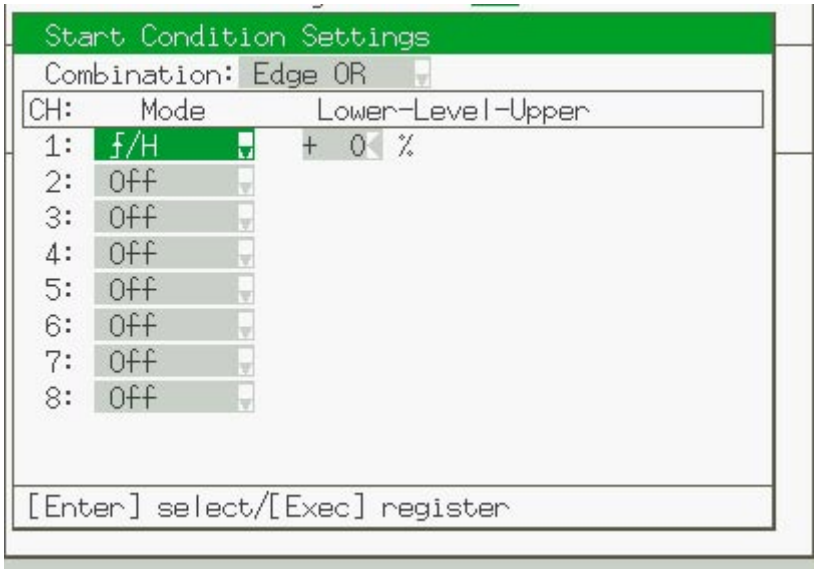
(5) Press the RECORD key, then set the Trigger Settings as follows.

Common settings	Function	Memory
Start Conditions	Source	Internal
	Pre-trigger	50%



(6) Set the Start Condition Settings as follows.

Combination	Edge OR	Memory
Channel Setting	Mode	Up H
	Level	0% (50% when checking HSV amp)



(7) Make the settings channel by channel. Set the Mode to OFF for the channels which do not need to be checked.

(8) Input a 2 Hz triangle wave for checking the channel.
Input a 1 Hz sine wave if the additional memory is installed.
In the case of an FV amplifier, input 0 Hz, or open the input terminal.

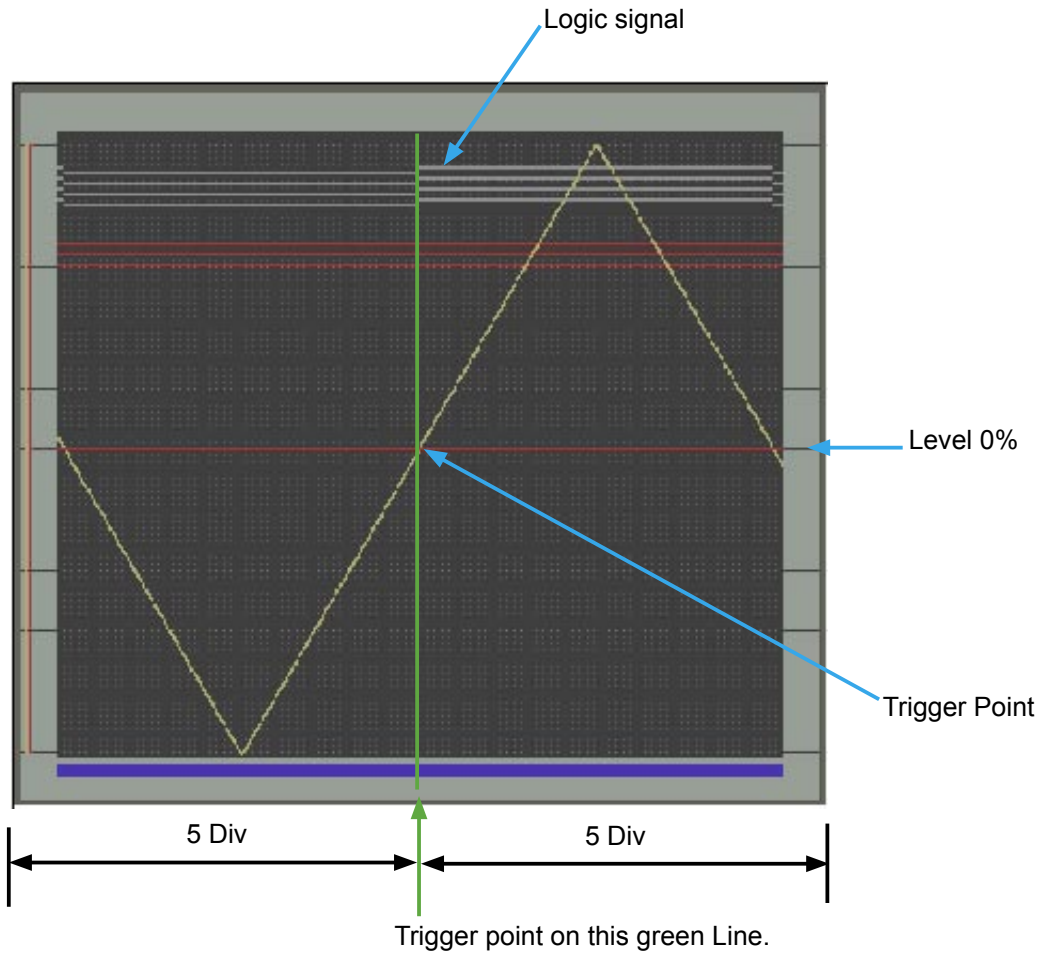
(9) Press the START/STOP key to start measurement.
In the case of an FV amplifier, change the signal to 1 kHz.

(10) After the data capture end message is displayed, press the START/STOP key to stop the measurement.

(11) Press the REPLAY/EXECUTE key to output the waveform.
Confirm that the waveform below is displayed.

Check the captured data in memory

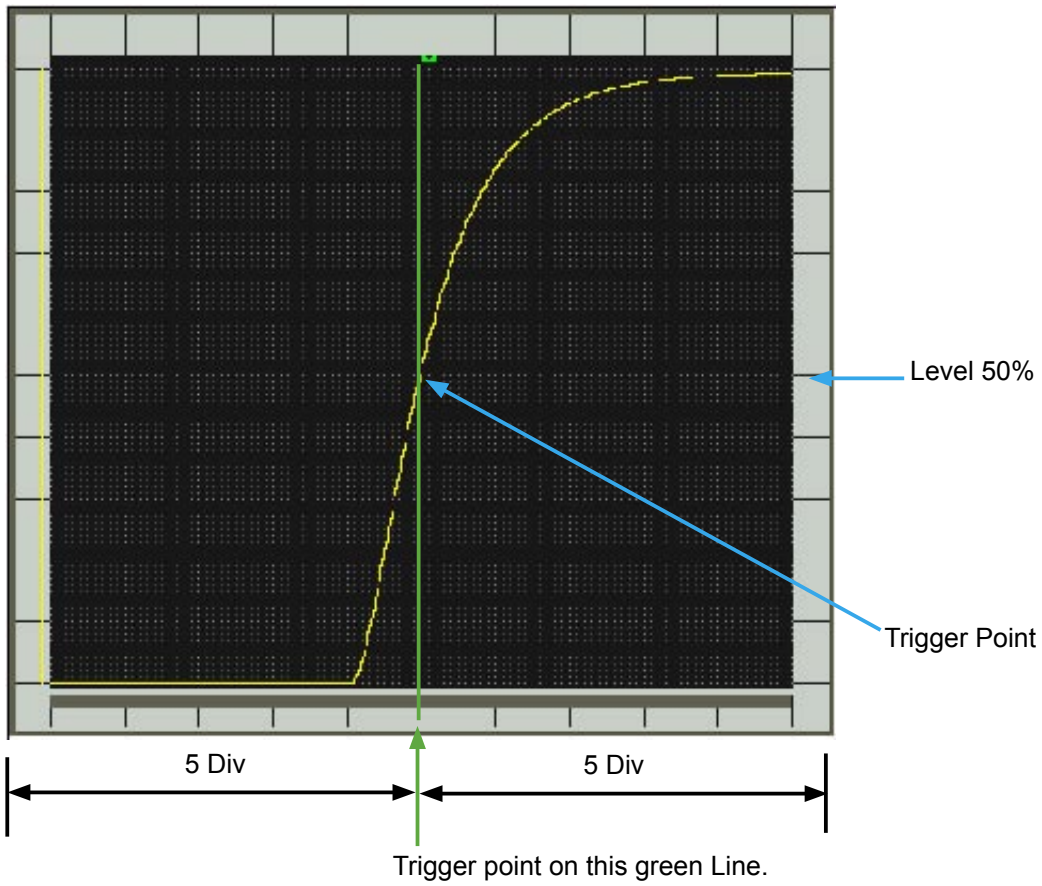
(for V, M, DC and HSV amplifiers)



- Confirm that the trigger point is created as shown above.
- Confirm that a correctly shaped triangle waveform is displayed.
- Confirm that the waveform is not skipped or jagged.
- If a Logic amplifier is installed, it also needs to be checked.
  (You can connect the signal with the analog input channels in parallel)
- Check all the channels in sequential order.

Checking the data captured in memory

(In the case of an FV amplifier)

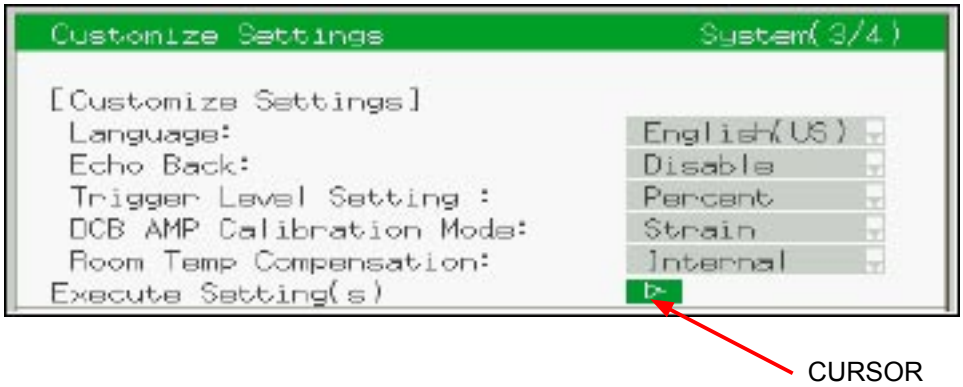


- Confirm that the trigger point is created as shown above.
- Confirm that a correctly shaped triangle waveform is displayed.
- Confirm that the waveform is not skipped or jagged.

4. SETUP PROCEDURES

4.1 Entering the System Setup menu

(1) Press the [SYSTEM] key until the “Customize Settings System(3/4)” MENU shown below appears.



(2) Move the cursor to the “Execute Setting(s)” position as shown above.

(3) Press the [ENTER] key to display the "No change." message shown below.

(4) Press the [SHIFT] key.

(5) Press the [ENTER] key to display the menu below from which you can execute the various Setup operations.

SYSTEM Page	Item	Description	Remark
5	Setup	Setup of amp	AMP
6	Modify LPF freq	Change of filter setting	Not for std. model
7	Setup MAC Address	MAC Address setting	Do not change this setting
8	Key Test	Key test	Monitor

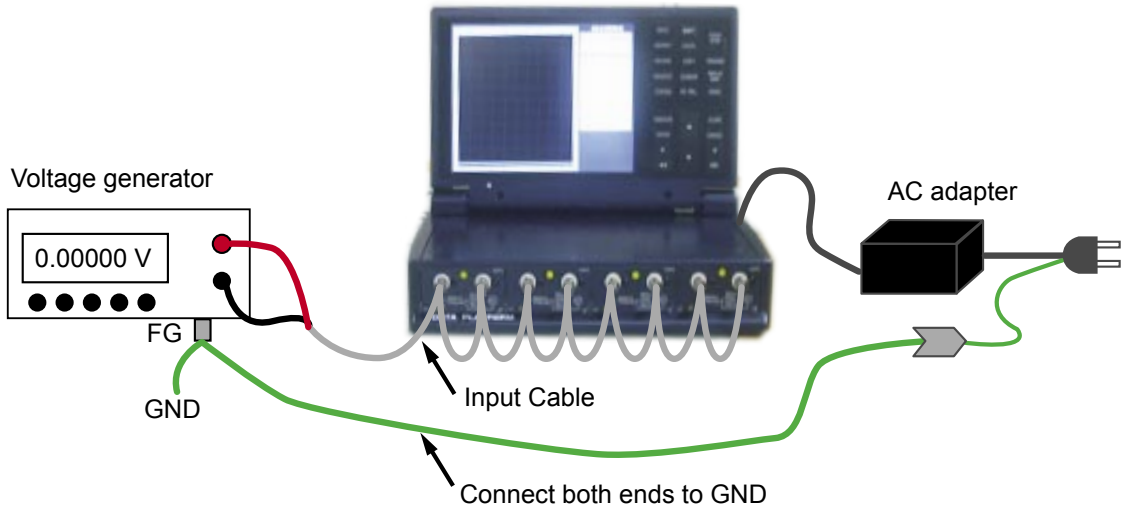
4.2 Setting Up the V (Voltage Input) Type Amp (GL1000)

This procedure is required when any part of the V-amp is replaced

Preparation

- Have a voltage generator on hand that can output voltage up to 500 VDC (four-digit output).
- Mutually connect the ground terminals of the voltage generator and GL1000.

Wiring connection



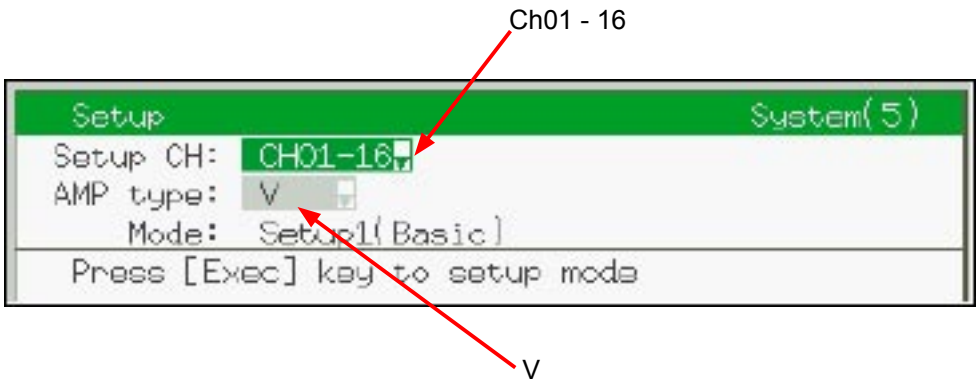
Setup procedure

(1) As shown in the figure above, connect the output of the voltage generator to the GL1000's amp input terminal.

(2) Leave the GL1000 turned on for at least 30 minutes.

(3) Set the measurement mode to RECORDER mode.

(4) After entering the System Setup mode, open the Setup menu as shown below.
Specify the measurement conditions as shown below.
Setup CH :Ch01-16 or Ch01-08.
Setup AMP type :V



(5) Press the [EXECUTE] key.

(6) The “GND : [Start] exec.” message is displayed at the location shown above.

(7) Input “0.000mV” to the input terminals of all channels.

(8) Press the [START/STOP] key and then wait until the "50 mV : [Start] exec." message appears. Specify the voltage generator's output voltage setting to correspond to one of the displayed voltage ranges in the following table, and then input that voltage to the GL1000.

Message	Input Voltage
50 mV	50.000 mV
100 mV	100.000 mV
200 mV	200.000 mV
500 mV	500.000 mV
1 V	1.000 V
2 V	2.000 V
5 V	5.000 V

Note

If each displayed voltage is within 70% to 90%, then the amp is OK. But if the voltage differs greatly, the amp needs to be repaired. After repairing the amp, this setup procedure must be performed again.

(9) Repeat step (8) by sequentially setting the Measure parameter to 50 mV, 100 mV, 200 mV, 500 mV, 2 V, and 5 V, and then inputting the corresponding voltage.

(10) When you have finished the Setup operation for 5 V, the "EEPROM : [Exec] to start " message appears. Press the [EXECUTE] key to begin writing the new Setup data to the EEPROM of each amp.

(11) After the setup parameters have been registered to the EEPROM, the display closes and returns to normal mode.

(12) Turn off the GL1000.

This completes the setup of the V type amp(s).

4.3 Setting Up the M (Multi-Input) Type Amp

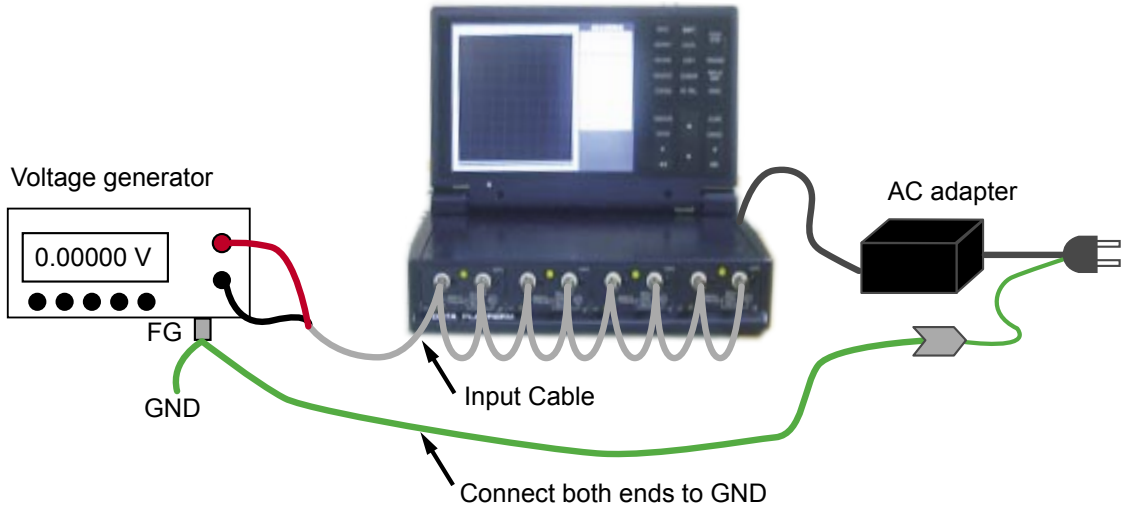
This procedure is required when any part of the M-amp is replaced

4.3.1 Setup 1 (Voltage)

Preparation

- Have a voltage generator on hand that can output voltage up to 1 VDC (four-digit output).
- Mutually connect the ground terminals of the voltage generator and GL1x00.

Wiring connection



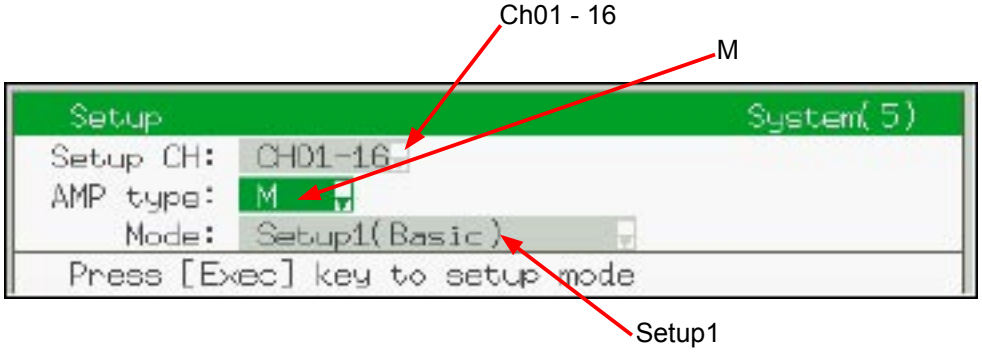
Setup procedure

(1) As shown in the figure above, connect the output of the voltage generator to the GL1x00's amp input terminal.

(2) Leave the GL1x00 turned on for at least 30 minutes.

(3) Set the measurement mode to RECORDER mode.

(4) After entering the System Setup mode, open the Setup menu as shown below.
Specify the measurement conditions as shown below.
Setup CH :Ch01-16 or Ch01-08
Setup AMP type :M
Mode :Setup1



(5) Press the [EXECUTE] key.

(6) The “GND : [Start] exec.” message is displayed at the location shown above.

(7) Input “0.000mV” to the input terminals of all channels.

(8) Press the [START/STOP] key and then wait until the "20 mV : [Start] exec." message appears. Specify the voltage generator's output voltage setting to correspond to one of the displayed voltage ranges in the following table, and then input that voltage to the GL1x00.

Message	Input Voltage
20 mV	20.000 mV
50 mV	50.000 mV
100 mV	100.000 mV
200 mV	200.000 mV
500 mV	500.000 mV
1 V	1.000 V

Note

If each displayed voltage is within 70% to 90%, then the amp is OK. But if the voltage differs greatly, the amp needs to be repaired. After repairing the amp, this setup procedure must be performed again.

(9) Repeat step (8) by sequentially setting the Measure parameter to 20 mV, 50 mV, 100 mV, 200 mV, 500 mV and 1 V, and then inputting the corresponding voltage.

(10) When you have finished the Setup operation for 1 V, the "EEPROM : [Exec] to start " message appears. Press the [EXECUTE] key to begin writing the new Setup data to the EEPROM of each amp.

(11) After the setup parameters have been registered to the EEPROM, the display closes and returns to normal mode.

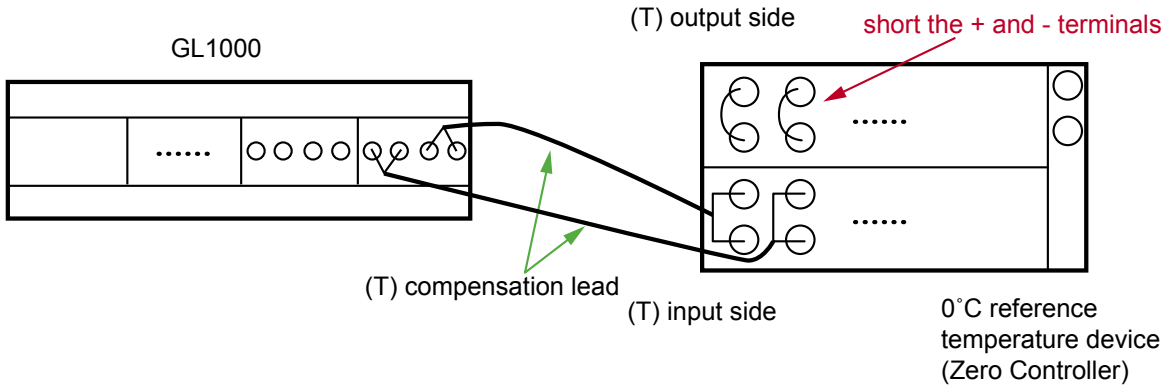
(12) Turn off the GL1x00.
Next, perform "Setup2"

4.3.2 Setup 2 (Room Temperature Compensation)

Preparation

As shown below, use (T) temperature compensation leads to connect the target amps to the 0˚C reference temperature device (Zero controller). Also be sure to use (T) temperature compensation leads to connect the M type amps to each other.

Wiring connection



CAUTION

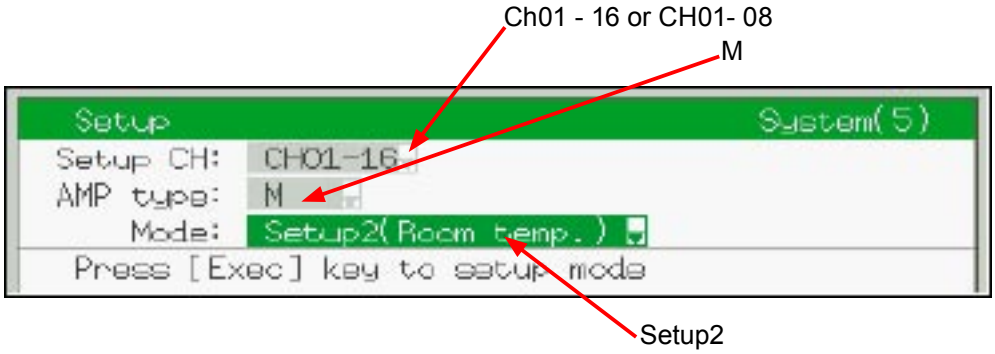
Connect each compensation copper lead to a single terminal as shown in the above diagram (parallel wiring is not permitted).

(1) As shown in the figure above, connect the input of the zero controller to the GL1x00's amp input terminal.

(2) Leave the GL1x00 turned on for at least 30 minutes.

(3) Set the measurement mode to RECORDER mode.

(4) After entering the System Setup mode, open the Setup menu as shown below.
Specify the measurement conditions as shown below.
Setup CH :Ch01-16 or Ch01-08
Setup AMP type :M
Mode :Setup2



(5) Press the [EXECUTE] key.

(6) The “rTemp : [Start] exec.” message is displayed at the location shown above.

(7) Press the [START/STOP] key and then wait until the "EEPROM : [Exec] to start " message appears.

(8) Press the [EXECUTE] key to begin writing the new Setup data to the EEPROM of each amp.

(9) After the setup parameters have been registered to the EEPROM, the display closes and returns to normal mode.

(10) Turn off the GL1x00.

This completes the setup of the M type amp(s).

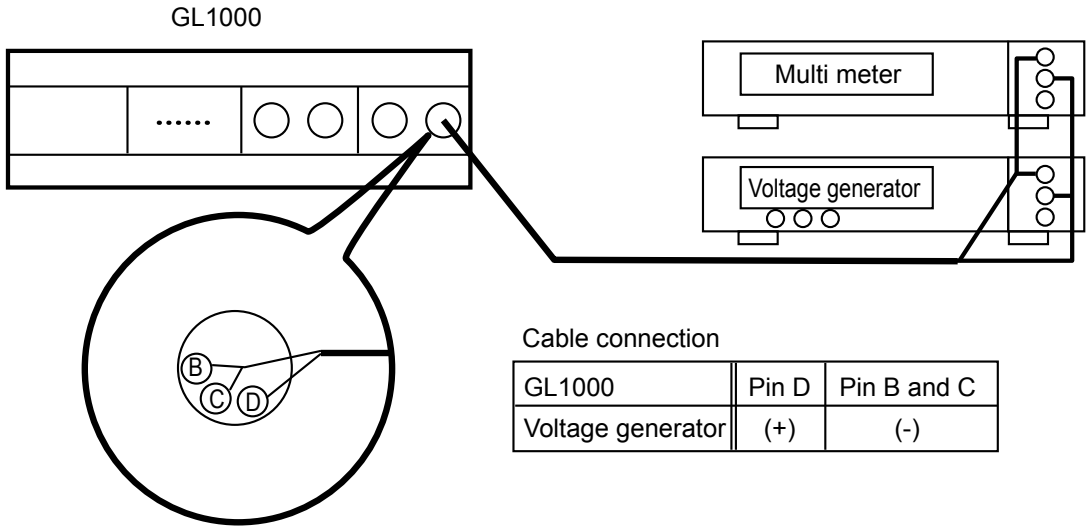
4.4 Setting Up the DCB-AMP Type Amp

This procedure is required when any part of the DCB-amp is replaced

Preparation

As shown below, use a multi-meter and voltage generator.

Wiring connection



Cable connection

GL1000	Pin D	Pin B and C
Voltage generator	(+)	(-)

Note

Connect FG of the voltage generator and the AC adapter.

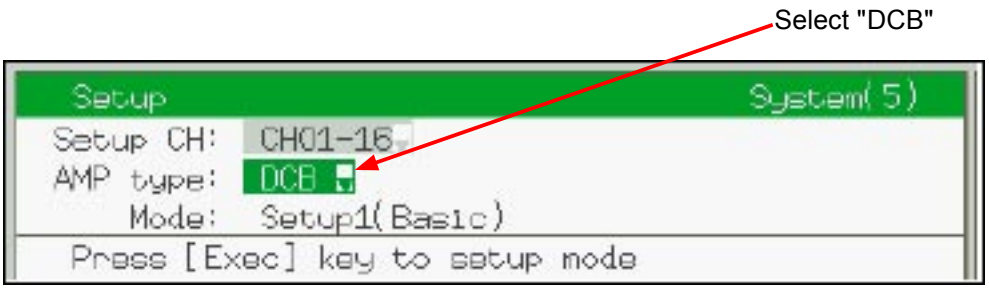
Setup procedure

(1) Connect the voltage generator (Low noise type, YEW2553 compatible model).
Connect the multi-meter to the voltage generator in parallel.

(2) Leave the GL1x00 turned on for at least 30 minutes.

(3) Set the measurement mode to RECORDER mode.

(4) After entering the System Setup mode, open the Setup menu as ahown below.
Specify the measurement conditions as shown below.
Setup CH :Ch01-16 or Ch01-08
Setup AMP type :DCB



(5) Press the [EXECUTE] key.

(6) The “BAL : [Start] to start.” message is displayed at the location shown above.

(7) Input “0.000 mV” to the input terminals of all channels.

Note

Adjust the voltage within 0.0005 mV to -0.0005 mV using the multi-meter.

(8) Press the [START/STOP] key and then wait until the "GND : [Start] to start." message appears.

(9) Press the [START/STOP] key and then wait until the "1m strain : [Start] to start." message appears. Specify the voltage generator's output voltage setting to correspond to one of the displayed voltage ranges in the following table, and then input that voltage to the GL1x00.

Message	Input Voltage
1 m strain	0.9995 to 1.0005 mV
2 m strain	1.999 to 2.001 mV
5 m strain	4.998 to 5.002 mV
10 m strain	9.995 to 10.005 mV
20 m strain	19.99 to 20.01 mV

Note

If each displayed voltage is within 70% to 90%, then the amp is OK. But if the voltage is differs greatly, the amp needs to be repaired. After repairing the amp, this setup procedure must be performed again.

(10) Repeat step (9) by sequentially setting the Measure parameter to 1 m strain, 2 m strain, 5 m strain, 10 m strain and 20 m strain, and then inputting the corresponding voltage.

(11) When you have finished the Setup operation for 20 m strain, the "EEPROM : [Exec] to start " message appears.
Press the [EXECUTE] key to begin writing the new Setup data to the EEPROM of each amp.

(12) After the setup parameters have been registered to the EEPROM, the display closes and returns to normal mode.

(13) Turn off the GL1x00.

This completes the setup of the DCB type amp(s).

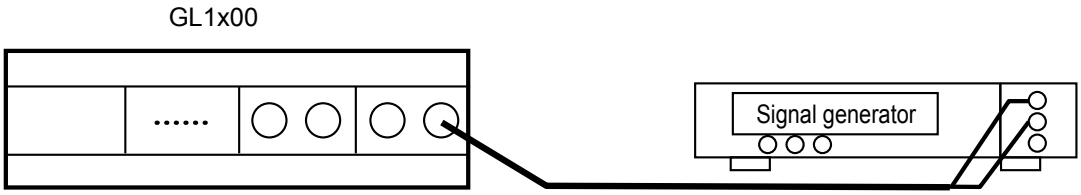
4.5 Setting Up the F/V Type Amp (GL1000)

This procedure is required when any part of the F/V-amp is replaced

Preparation

As shown below, use a signal generator.

Wiring connection



Note

Connect FG of the signal generator and the AC adapter.

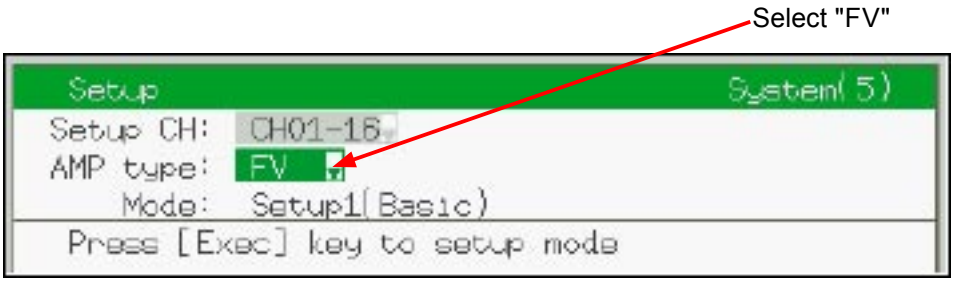
Setup procedure

(1) Connect a signal generator which generates exactly 40 kHz to the F/V amp input terminal.

(2) Leave the GL1000 turned on for at least 30 minutes.

(3) Set the measurement mode to RECORDER mode.

(4) After entering the System Setup mode, open the Setup menu as shown below.
Specify the measurement conditions as shown below.
Setup CH :Ch01-16 or Ch01-08
Setup AMP type :FV



(5) Press the [EXECUTE] key.

(6) The “GND : [Start] to start.” message is displayed at the location shown above.

(7) Input “+/- 5 V / 0 Hz(⎍⎍)” to the input terminals of all channels.

(8) Press the [START/STOP] key and then wait until the "40KHz : [Start] to start." message appears.

(9) Input “+/- 5 V / 40 Hz(⎍⎍)” to the input terminals of all channels.

Note

If each displayed frequency is within 34 kHz to 38 kHz, then the amp is OK. But if the voltage differs greatly, the amp needs to be repaired. After repairing the amp, this setup procedure must be performed again.

(10) Press the [START/STOP] key and then wait until the "EEPROM : [Exec] to start " message appears. Press the [EXECUTE] key to begin writing the new Setup data to the EEPROM of each amp.

(11) After the setup parameters have been registered to the EEPROM, the display closes and returns to normal mode.

(12) Turn off the GL1000.

This completes the setup of the F/V type amp(s).

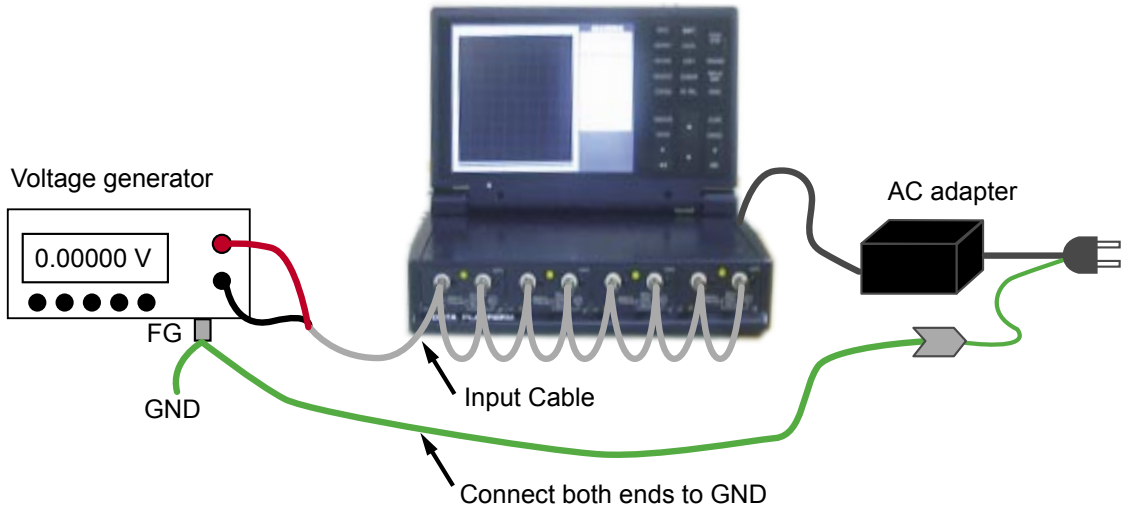
4.6 Setting Up the HSV (High Speed Voltage Input) Type Amp (GL1100)

This procedure is required when any part of the HSV-amp is replaced

Preparation

- Have a voltage generator on hand that can output voltage up to 200 VDC (four-digit output).
- Mutually connect the ground terminals of the voltage generator and GL1100.

Wiring connection

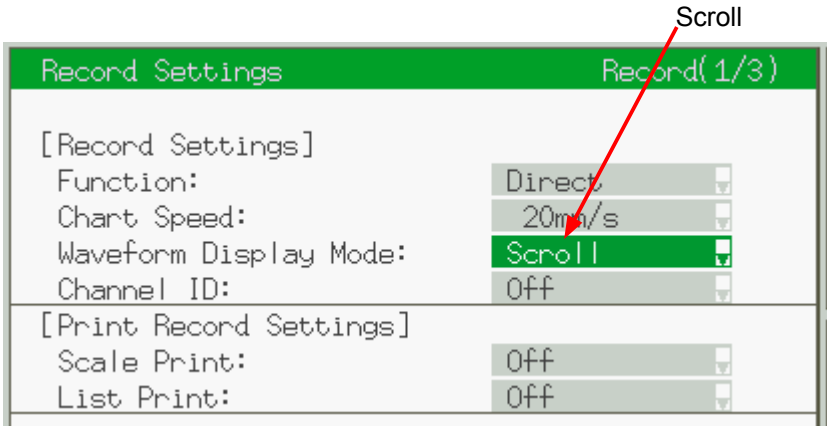


Setup procedure

(1) As shown in the figure above, connect the output of the voltage generator to the GL1100's amp input terminal.

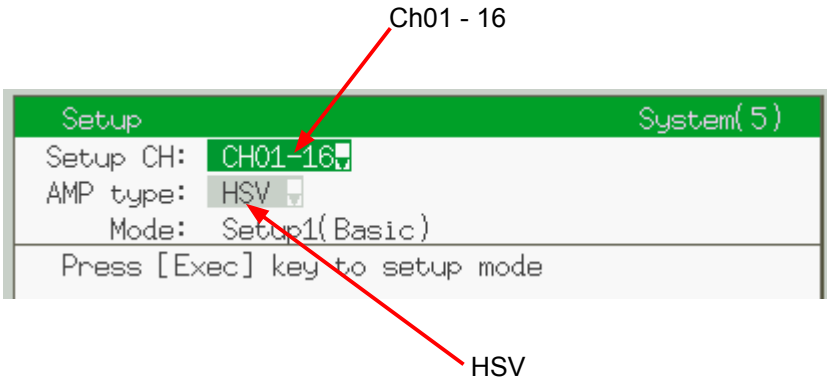
(2) Leave the GL1100 turned on for at least 30 minutes.

(3) Set the Waveform Display mode to Scroll mode.



(4) Set the measurement mode to RECORDER mode.

(5) After entering the System Setup mode, open the Setup menu as shown below.
Specify the measurement conditions as shown below.
Setup CH :Ch01-16 or Ch01-08.
Setup AMP type :HSV



(6) Press the [EXECUTE] key.

(7) The “GND : [Start] exec.” message is displayed at the location shown above.

(8) Input “0.000mV” to the input terminals of all channels.

(9) Press the [START/STOP] key and then wait until the "200 mV : [Start] exec." message appears.
Specify the voltage generator's output voltage setting to correspond to one of the displayed voltage ranges in the following table, and then input that voltage to the GL1100.

Message	Input Voltage
200 mV	200.000 mV
500 mV	500.000 mV
1 V	1.000 V
2 V	2.000 V
5 V	5.000 V
10 V	10.000 V
20 V	20.000 V
50 V	50.000 V
100 V	100.00 V
200 V	200.00 V

Note
If each displayed voltage is within 70% to 90%, then the amp is OK. But if the voltage differs greatly, the amp needs to be repaired. After repairing the amp, this setup procedure must be performed again.

(10) Repeat step (8) by sequentially setting the Measure parameter to 200 mV, 500 mV, 2 V, 5 V, 10 V, 20 V, 50 V, 100 V and 200 V, and then inputting the corresponding voltage.

(11) When you have finished the Setup operation for 200 V, the "EEPROM : [Exec] to start " message appears.
Press the [EXECUTE] key to begin writing the new Setup data to the EEPROM of each amp.

(12) After the setup parameters have been registered to the EEPROM, the display closes and returns to normal mode.

(13) Turn off the GL1100.

This completes the setup of the HSV type amp(s).

5. ADJUSTMENTS

5.1 Adjusting the V Amp Overshoot (GL1000)

This procedure is required when any part of the V-amp is replaced

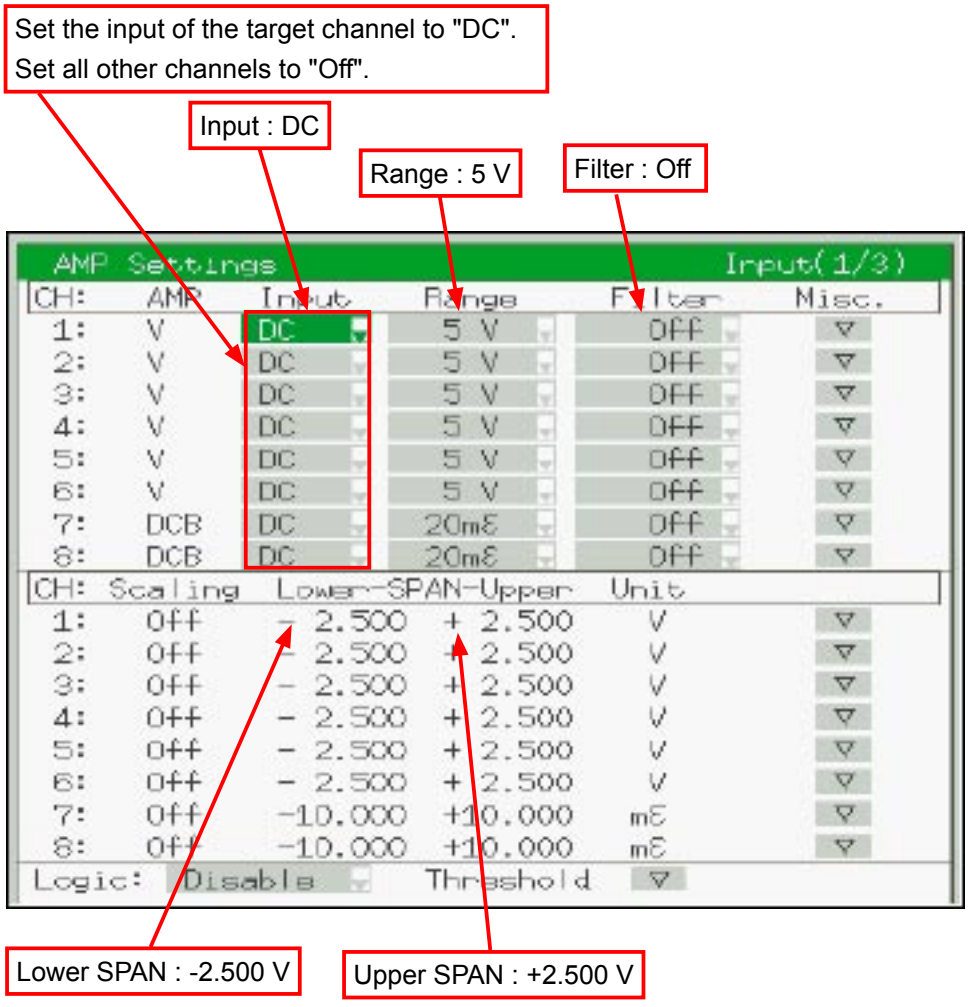
Adjustment procedure

(1) Connect the signal generator to the GL1000's amp input terminal.
(Connect the FG of the GL1000 and signal generator)

(2) Set the GL1000's measurement mode to RECORDER mode.

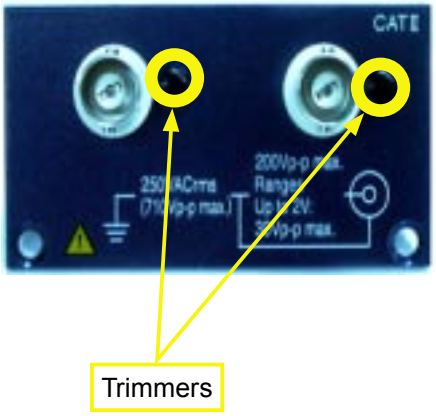
(3) Press the [INPUT] key and set the AMP setting conditions.

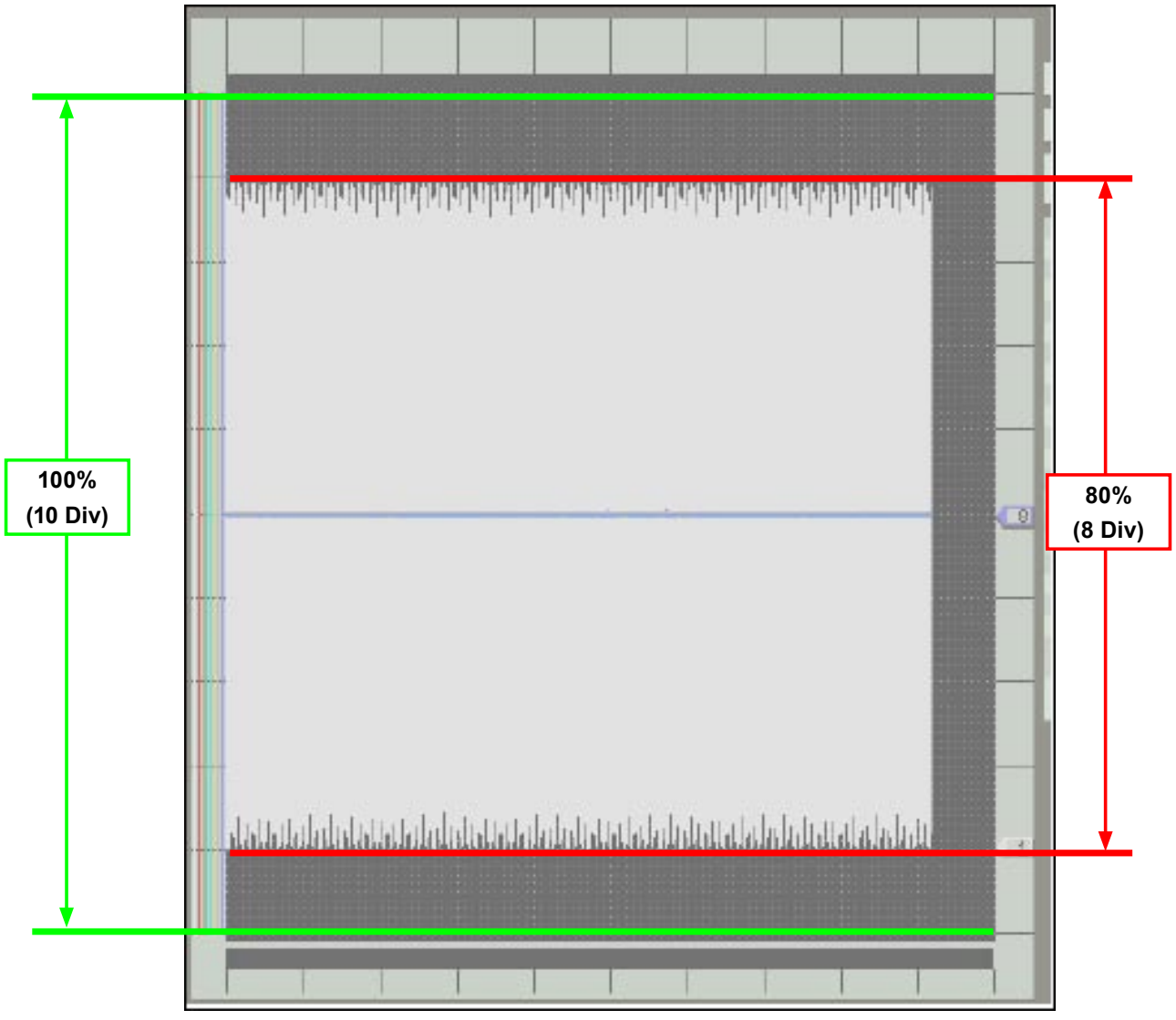
(4) Specify the measurement conditions as shown below.
Set the input of the target channel to "DC".
Set the input of all other channels to "Off".
Set the range to "5 V"
Set the filter to "Off"
Set the upper span to "+2.500 V".
Set the lower span to "-2.500 V".


Set the input of the target channel to "DC".
Set all other channels to "Off".
Input : DC
Range : 5 V
Filter : Off
AMP Settings
Input(1/3)
CH: AMP Input Range Filter Misc.
1: V DC 5 V Off
2: V DC 5 V Off
3: V DC 5 V Off
4: V DC 5 V Off
5: V DC 5 V Off
6: V DC 5 V Off
7: DCB DC 20mE Off
8: DCB DC 20mE Off
CH: Scaling Lower-SPAN-Upper Unit
1: Off - 2.500 + 2.500 V
2: Off - 2.500 + 2.500 V
3: Off - 2.500 + 2.500 V
4: Off - 2.500 + 2.500 V
5: Off - 2.500 + 2.500 V
6: Off - 2.500 + 2.500 V
7: Off -10.000 +10.000 mE
8: Off -10.000 +10.000 mE
Logic: Disable Threshold
Lower SPAN : -2.500 V
Upper SPAN : +2.500 V

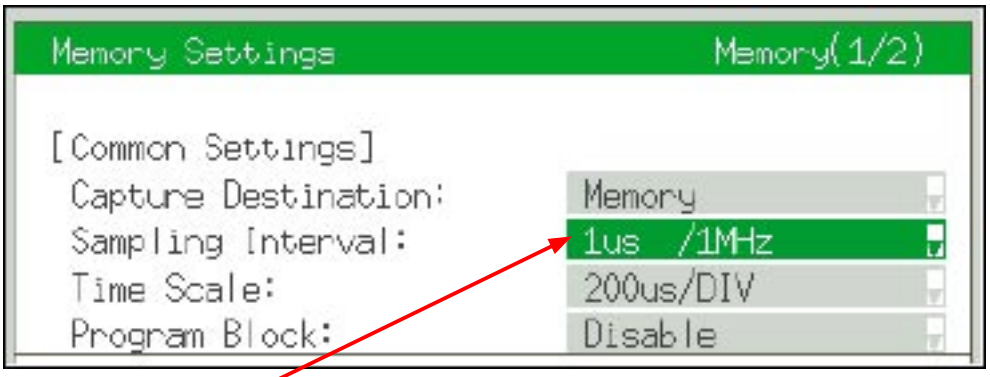
(5) Input ±2.5 V / 200 kHz / Sine wave from the signal generator.
Input signal
AMPTD : 5 V, FREQ : 200 kHz, FCTN : SIN(1)

(6) Adjust the trimmers so that the amplitude is 80% (77% to 83%).



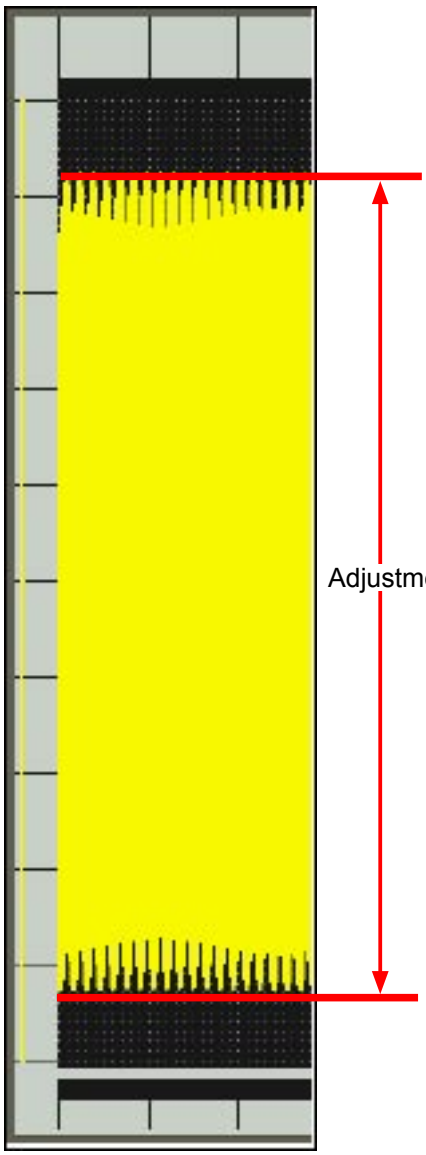


Note

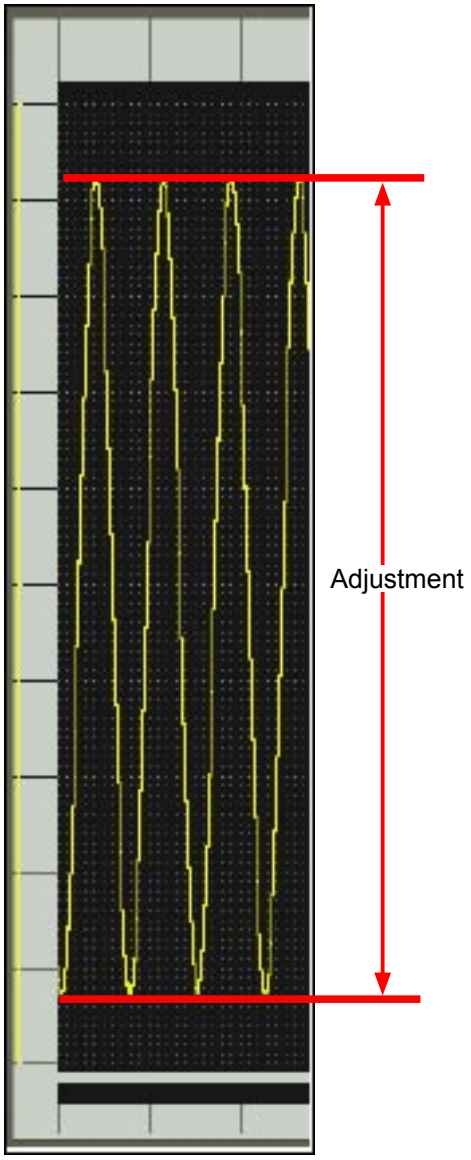


The shape of the displayed waveform depends on the setting of the sampling interval.
Both of these waveforms can be used for the adjustment. The adjustment must be performed with the waveform peaks.

1 ns waveform



10 ns waveform



6. INSPECTION AND CHECK PROCEDURES

6.1 Insulation Resistance

Use a megaohm meter (an insulation resistance gauge) to check that the insulation resistance between the following terminals are equal to or higher than the rated values.

Item	Measuring Terminals	Rated value	Remark
V-amp	SIG(-) to FG	Megaohm meter with an output capacity of 500 VDC, insulation resistance is 100 M ohm or more.	All channels
M-amp			
F/V-amp			
DCB-amp	SIG(C) to FG		
HSV-amp	SIG(-) to FG		
AC adapter	AC(Line) to FG	Megaohm meter with an output capacity of 500 VDC, insulation resistance is 20 M ohm or more.	Line input

6.2 Inspection and Check Methods

6.2.1 Measurement Accuracy

Supply the reference voltage or frequency determined for each measurement range to each installed amp, and then check the voltage or frequency accuracy.

Preparation

- Use a voltage generator for the V, M, DCB and HSV amps that can output up to 500 VDC (using four-digit settings).
- Use a signal generator for the F/V amp that can output rectangular waveforms, 0.0 Hz to 50 kHz frequency, 10 Vp-p AMPTD.
- Mutually connect the ground terminals of the voltage generator and the DM3x00 prior to initiating measurement.

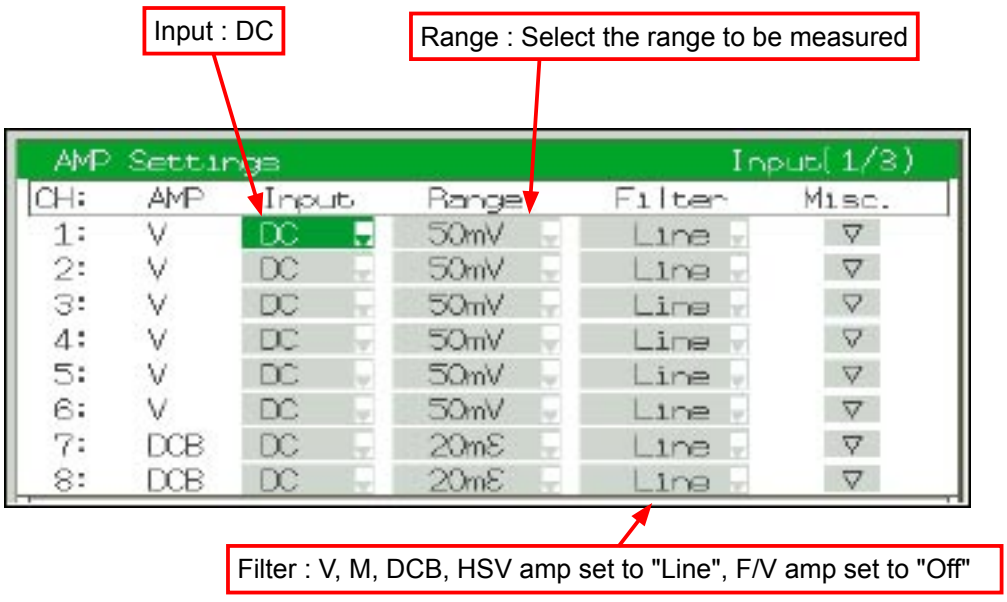
Wiring connection

Same wiring connection as the V, M, DCB, F/V or HSV amp setup. (See setup procedure)

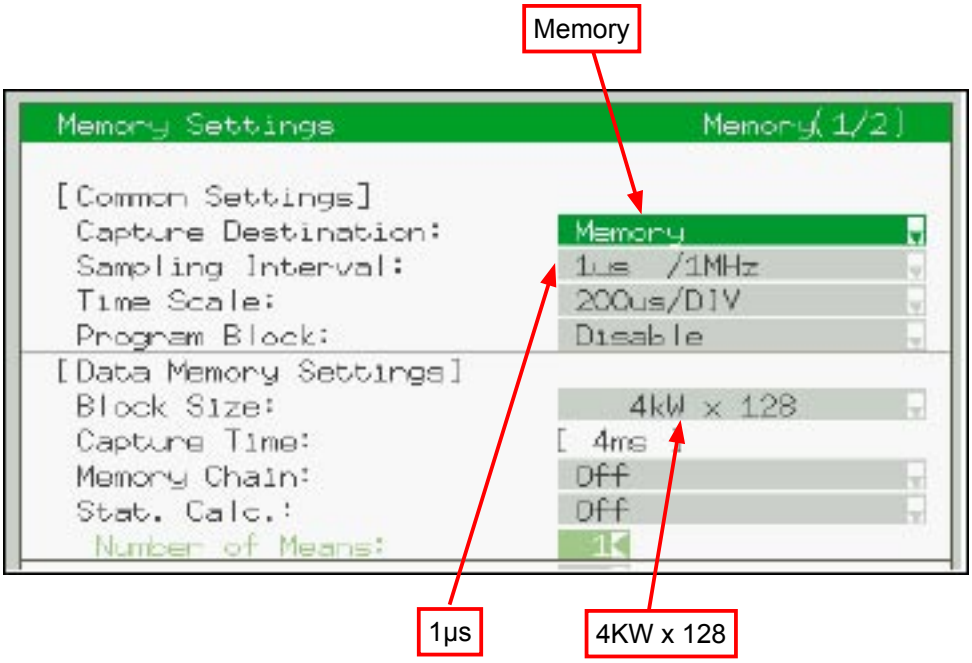
Setting procedure

(1) Press the [INPUT] key to display the "AMP setting" window as shown below, and then make the following settings.

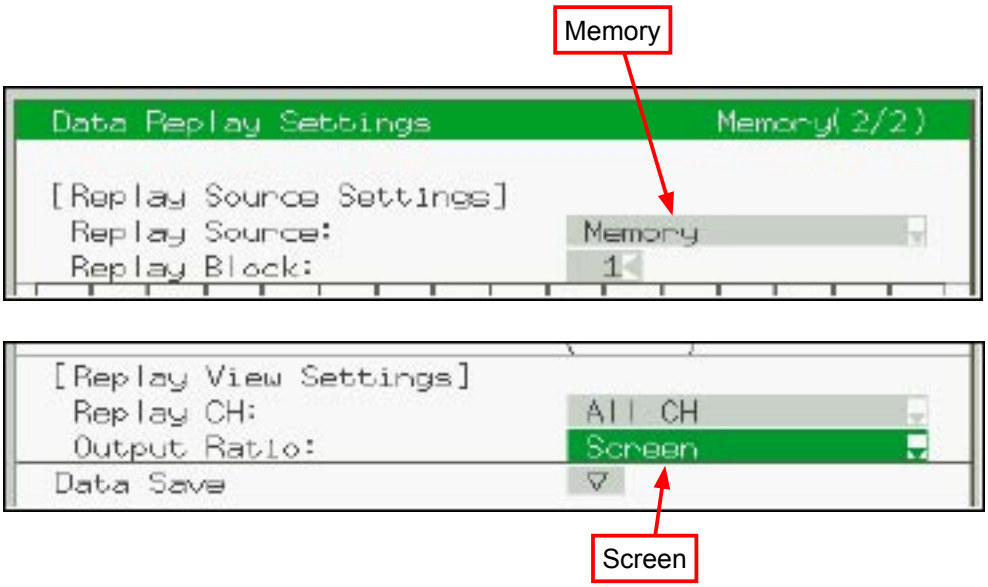
AMP : V, M, DCB, F/V or HSV (select the measuring amp)
Input : DC
Range : Select the range to be measured
Filter : V, M, DCB, HSV amp set to "Line", F/V amp set to "Off"


Input : DC
Range : Select the range to be measured
AMP Settings
Input(1/3)
CH: AMP Input Range Filter Misc.
1: V DC 50mV Line
2: V DC 50mV Line
3: V DC 50mV Line
4: V DC 50mV Line
5: V DC 50mV Line
6: V DC 50mV Line
7: DCB DC 20mS Line
8: DCB DC 20mS Line
Filter : V, M, DCB, HSV amp set to "Line", F/V amp set to "Off"

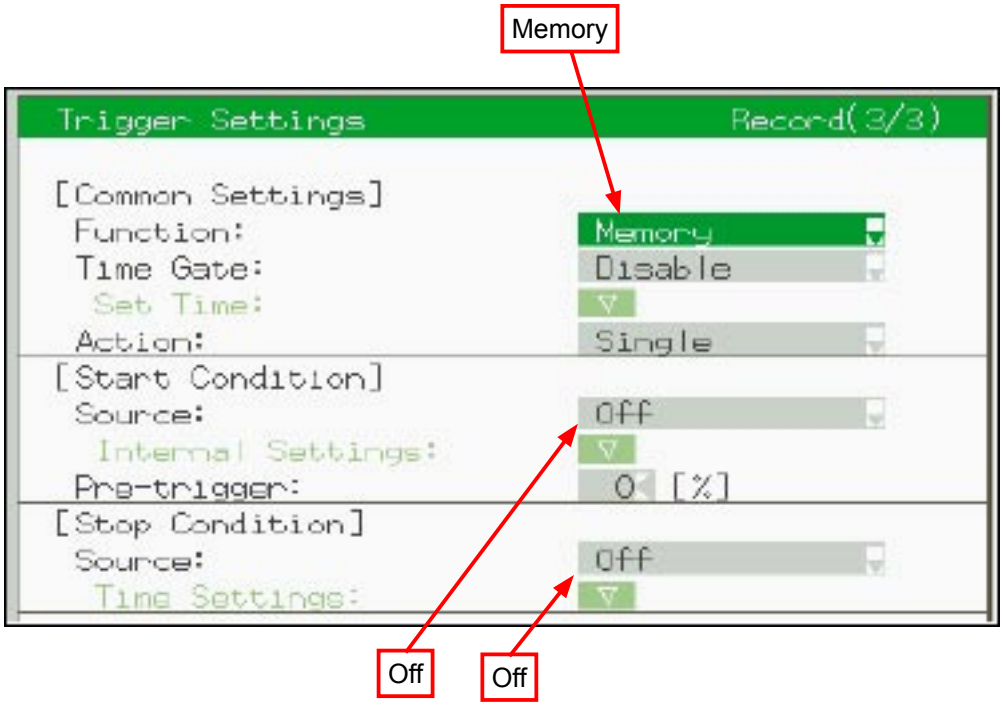
(2) Press the [MEMORY] key to display the "Memory Settings" window as shown below, and then make the following settings.
Capture Destination : Memory
Sampling Interval : 1 us
Block Size : 4 KW x 128



(3) Press the [MEMORY] key to display the "Data Replay Settings" window as shown below, and then make the following settings.
Replay Source : Memory
Output Ratio : Screen



(4) Press the [RECORD] key to display the "Trigger Settings" window as shown below, and then make the following settings.
Function : Memory
Start Condition Source : Off
Stop Condition Source: Off



Measurement procedure for V, M and HSV amps

(1) Input the reference voltage for each range according to the table below, and then check that the level of measurement is within the rating.

V amp : Voltage precision ratings		
Range	Input voltage	Rating (±0.2% of F.S.)
50 mV	0.00 mV	±0.1 mV
	+25.00 mV	
	+50.00 mV	
	-25.00 mV	
	-50.00 mV	
100 mV	+100.00 mV	±0.2 mV
	-100.00 mV	
200 mV	+200.00 mV	±0.4 mV
	-200.00 mV	
500 mV	+500.00 mV	±1 mV
	-500.00 mV	
1 V	+1.00 V	±0.002 V
	-1.00 V	
2 V	+2.00 V	±0.004 V
	-2.00 V	
5 V	+5.00 V	±0.01 V
	-5.00 V	
10 V	+10.00 V	±0.02 V
20 V	+20.00 V	±0.04 V
50 V	+50.00 V	±0.1 V
100 V	+100.00 V	±0.2 V
200 V	+200.00 V	±0.4 V

M amp : Voltage precision ratings		
Range	Input voltage	Rating (±0.2% of F.S.)
20 mV	0.00 mV	±0.04 mV
	+10.00 mV	
	+20.00 mV	
	-10.00 mV	
	-20.00 mV	
50 mV	+50.00 mV	±0.1 mV
	-50.00 mV	
100 mV	+100.00 mV	±0.2 mV
	-100.00 mV	
200 mV	+200.00 mV	±0.4 mV
	-200.00 mV	
500 mV	+500.00 mV	±1 mV
	-500.00 mV	
1 V	+1.00 V	±0.002 V
	-1.00 V	
2 V	+2.00 V	±0.004 V
	-2.00 V	
5 V	+5.00 V	±0.01 V
10 V	+10.00 V	±0.02 V
20 V	+20.00 V	±0.04 V
50 V	+50.00 V	±0.1 V
100 V	+100.00 V	±0.2 V
200 V	+200.00 V	±0.4 V
500 V	+500.00 V	±1 V

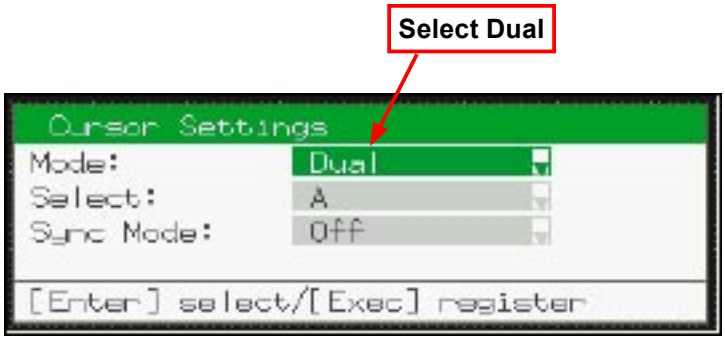
HSV amp : Voltage precision ratings		
Range	Input voltage	Rating (±0.4% of F.S.)
200 mV (20 mmV/DIV)	0.00 mV	±0.8 mV
	+100.00 mV	
	+200.00 mV	
	-100.00 mV	
	-200.00 mV	
500 mV (50 mmV/DIV)	+500.00 mV	±2 mV
	-500.00 mV	
1 V (100 mmV/DIV)	+1.00 V	±0.004 V
	-1.00 V	
2 V (200 mmV/DIV)	+2.00 V	±0.008 V
	-2.00 V	
5 V (500 mmV/DIV)	+5.00 V	±0.02 V
	-5.00 V	
10 V (1 V/DIV)	+10.00 V	±0.04 V
20 V (2 V/DIV)	+20.00 V	±0.08 V
50 V (5 V/DIV)	+50.00 V	±0.2 V
100 V (10 V/DIV)	+100.00 V	±0.4 V
200 V (20 V/DIV)	+200.00 V	±0.8 V

(2) Press the [START/STOP] key then wait until the "Finished" message is displayed.

(3) Press the [START/STOP] key to stop measurement.

(4) Press the [REPLAY/EXIT] key to display the waveform.

(5) Press the [CURSOR] key to display the "Cursor Settings" window as shown below, and then make the following settings.
Mode : Dual

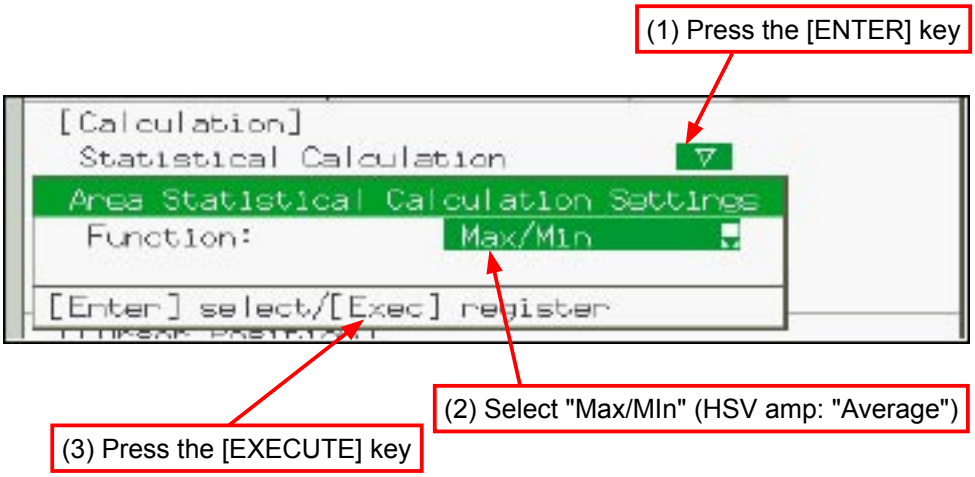


(6) Press the [EXECUTE] key to register the cursor settings.
Note : Two cursors are displayed.

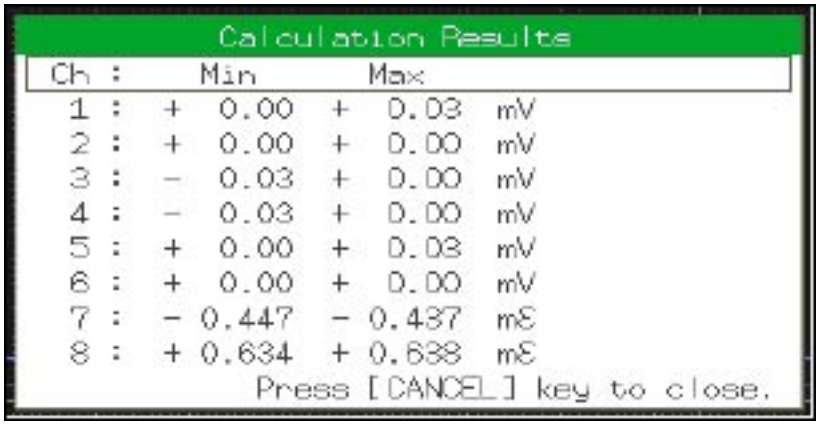
(7) Press the [READOUT] key to display the "Readout Menu", select the "Statistical Calculation" window as shown below, and then make the following settings.

Function : Max/Min

: Average (HSV amp for DM3300)



(8) Select "Execute" and then press the [ENTER] key to display the Max/Min values as shown below. Confirm that the values are within the ratings. If measuring with the HSV amp, the Average values are displayed.


Calculation Results
Ch : Min Max
1 : + 0.00 + 0.03 mV
2 : + 0.00 + 0.00 mV
3 : - 0.03 + 0.00 mV
4 : - 0.03 + 0.00 mV
5 : + 0.00 + 0.03 mV
6 : + 0.00 + 0.00 mV
7 : - 0.447 - 0.437 mε
8 : + 0.634 + 0.638 mε
Press [CANCEL] key to close.

Note : Press the [SHIFT] key and then press the [REPLAY/EXIT] key to change the measurement range.

Measurement procedure for DCB amp

(1) Input the reference voltage for each range according to the table below, and then check that the level of measurement is within the rating.

DCB amp : Voltage precision ratings		
Range	Input voltage	Rating (±0.25% of F.S.)
1 m strain	0.000 mV	±0.01 m strain.....Note 1
	+0.500 mV	±0.0035 m strain.....Note 2
	+1.000 mV	
	-0.500 mV	
	-1.000 mV	
2 m strain	0.000 mV	±0.01 m strain.....Note 1
	+2.000 mV	±0.006 m strain.....Note 2
5 m strain	0.000 mV	±0.0135 m strain.....Note 1
	+5.000 mV	±0.0135 m strain.....Note 2
10 m strain	0.000 mV	±0.026 m strain.....Note 1
	+10.000 mV	±0.026 m strain.....Note 2
20 m strain	0.000 mV	±0.051 m strain.....Note 1
	+20.000 mV	±0.051 m strain.....Note 2

Note 1 : Confirm that the value is within the above tolerance after performing Auto balance.

Note 2. : Confirm that the value is within the above tolerance after subtracting the 0 position value.

<Example>

0 : 0.003 m strain..... The value is within 0.01 m, and it is OK.

1 m : 1.005 m strain..... 1.005 m - 0.003 m = 1.002 m, it is within 0.0035 m, and it is OK.:

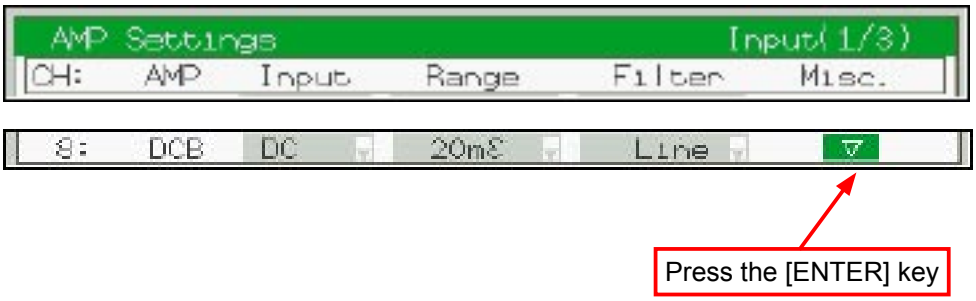
Perform Auto balance before measuring 0 % of each range.

Auto balance procedure

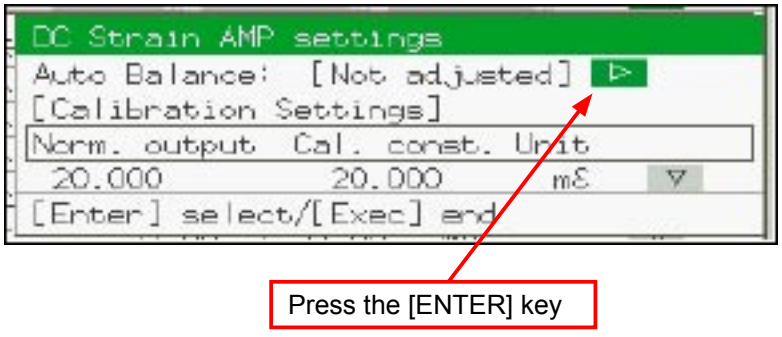
(a) Input "0.000 mV (+0.0005 mV to -0.0005 mV)" to the input terminal of all channels.

(b) Press the [INPUT] key to display the AMP Settings window as shown below.

(c) Move the cursor of the channel for adjustment to the "Misc." position.



(d) Press the [ENTER] key to display the DC Strain AMP Settings window as shown below.



(e) Press the [ENTER] key to execute Auto balance.

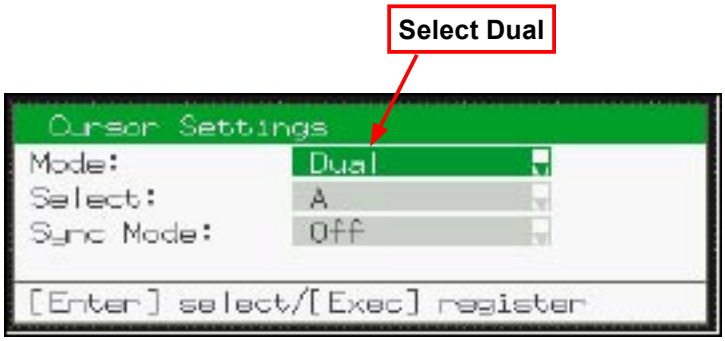
Be sure to perform Auto balance after changing the measurement range.

(2) Press the [START/STOP] key then wait until the "Finished" message is displayed.

(3) Press the [START/STOP] key to stop measurement.

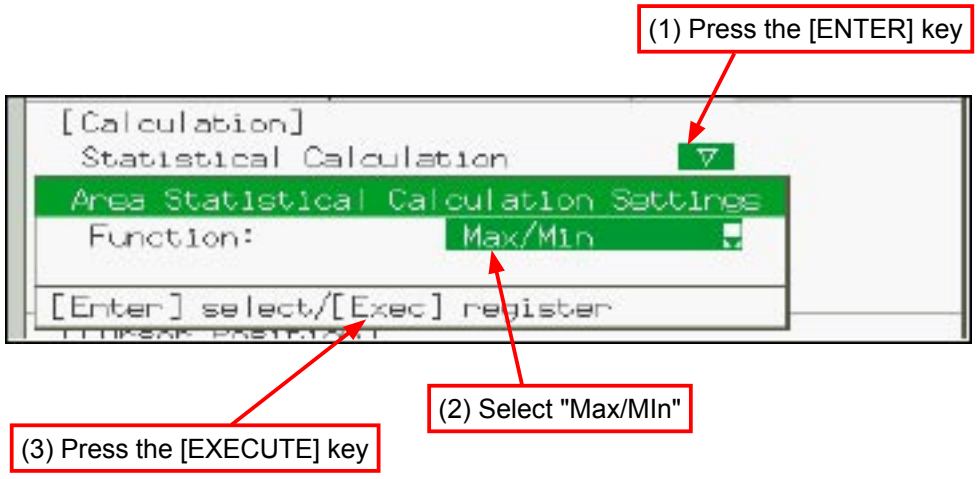
(4) Press the [REPLAY/EXIT] key to display the waveform.

(5) Press the [CURSOR] key to display the "Cursor Settings" window as shown below, and then make the following settings.
Mode : Dual

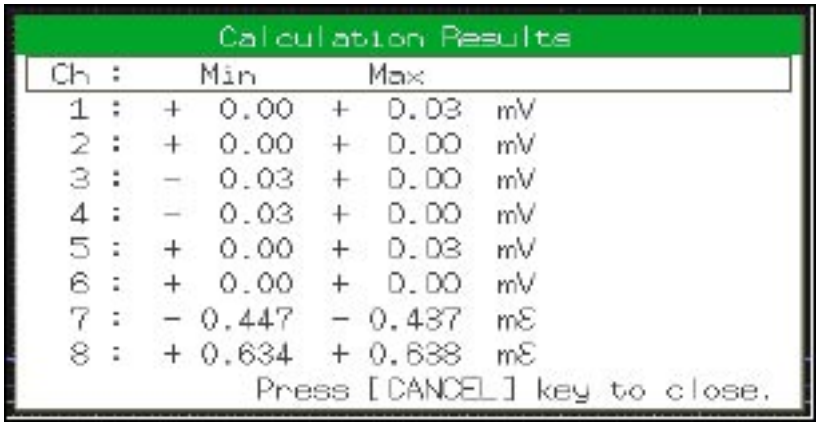


(6) Press the [EXECUTE] key to register the cursor settings.
Note : Two cursors are displayed.

(7) Press the [READOUT] key to display the "Readout Menu", select the "Statistical Calculation" window as shown below, and then make the following settings.
Function : Max/Min



(8) Select "Execute" and then press the [ENTER] key to display the Max/Min values as shown below. Confirm that the values are within the ratings.


Calculation Results
Ch : Min Max
1 : + 0.00 + 0.03 mV
2 : + 0.00 + 0.00 mV
3 : - 0.03 + 0.00 mV
4 : - 0.03 + 0.00 mV
5 : + 0.00 + 0.03 mV
6 : + 0.00 + 0.00 mV
7 : - 0.447 - 0.437 mε
8 : + 0.634 + 0.638 mε
Press [CANCEL] key to close.

Note : Press the [SHIFT] key and then press the [REPLAY/EXIT] key to change the measurement range.

Measurement procedure for F/V amp

(1) Input the reference signal for each range according to the table below, and then check that the level of measurement is within the rating.

F/V amp : Signal precision ratings		
Range	Input Frequency	Rating (±0.4% of F.S.)
200 Hz	0.0 Hz	±0.8 Hz
	100.0 Hz	
	200.0 Hz	
400 Hz	400 Hz	±1.6 Hz
500 Hz	500 Hz	±2 Hz
1 kHz	1.000 kHz	±0.004 kHz
2 kHz	2.000 kHz	±0.008 kHz
4 kHz	4.000 kHz	±0.016 kHz
5 kHz	5.000 kHz	±0.02 kHz
10 kHz	10.00 kHz	±0.04 kHz
20 kHz	20.00 kHz	±0.08 kHz
40 kHz	40.00 kHz	±0.16 kHz

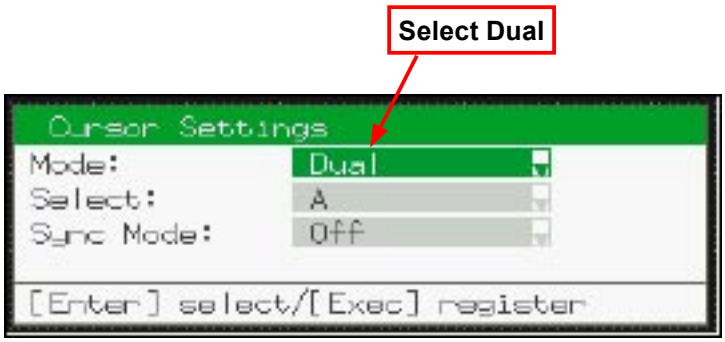
Function generator output
AMPTD : 10 V p-p
FCTN : rectangular wave (⎍)

(2) Press the [START/STOP] key then wait until the "Finished" message is displayed.

(3) Press the [START/STOP] key to stop the measurement.

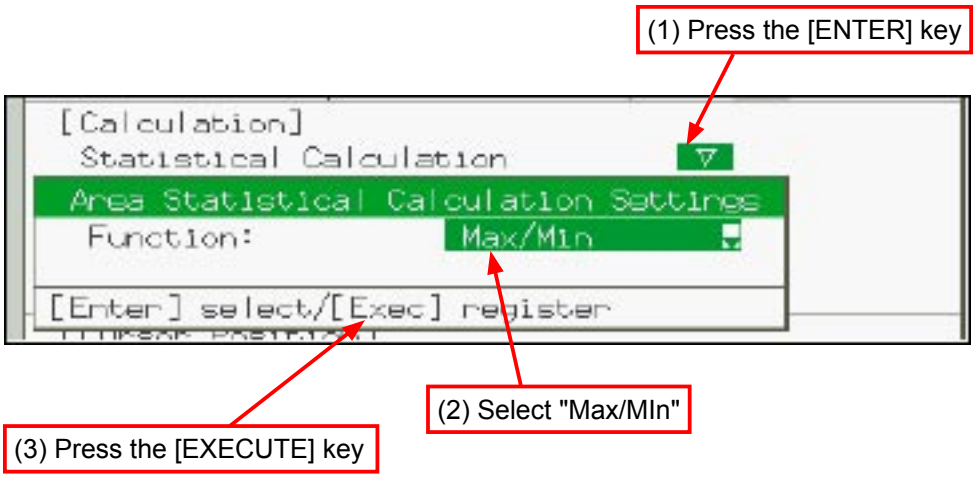
(4) Press the [REPLAY/EXIT] key to display the waveform.

(5) Press the [CURSOR] key to display the "Cursor Settings" window as shown below, and then make the following settings.
Mode : Dual



(6) Press the [EXECUTE] key to register the cursor settings.
Note : Two cursors are displayed.

(7) Press the [READOUT] key to display the "Readout Menu", select the "Statistical Calculation" window as shown below, and then make the following settings.
Function : Max/Min



(8) Select "Execute" and then press the [ENTER] key to display the Max/Min values as shown. Confirm that the values are within the ratings.
Note : Press the [SHIFT] key and then press the [REPLAY/EXIT] key to change the measurement range.

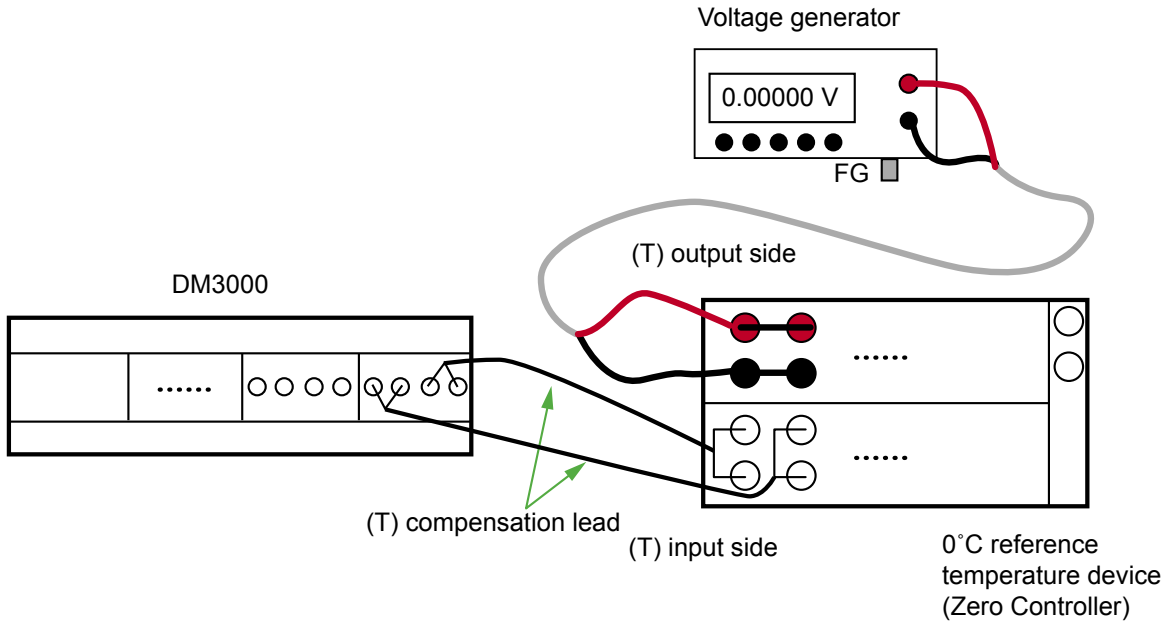
6.2.2 Temperature Accuracy

This inspection is only performed for M type amps.

Preparation

- Use (T) temperature compensation leads to connect the target amp and a 0˚C reference temperature device (zero controller) as shown below.
- As shown below, use copper leads to connect the 0˚C reference temperature device (zero controller) to a voltage generator that can specify output up to 1μV.

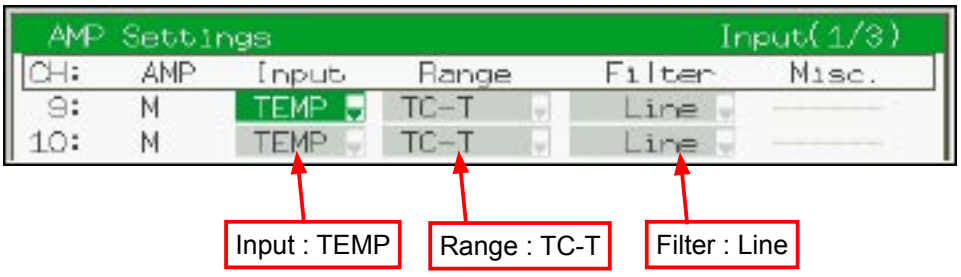
Wiring connection



Note : The compensation leads should be connected individually. Do not connect in parallel. Connect the FG of the voltage generator and AC adapter.

Setting procedure

(1) Press the [INPUT] key to display the "AMP settings" window as shown below, and then make the following settings.



Input : TEMP
Range : TC-T
Filter : Line

Measurement procedure for M amp (temperature accuracy)

(1) Set the measurement conditions as described above.

(2) Connect to the zero controller with the (T) compensation leads. (Connect each channel individually)

(3) Use the voltage generator to successively input the reference voltage signal for each range to the 0˚C reference temperature device (zero controller) according to the table below, then check that the level of measurement is within the rating.

M amp : Input voltage precision ratings (Type T)			
Temperature	Input voltage	Standard 1	Standard 2
0 ˚C	0.000 mV	-2.0 ˚C to +2.0 ˚C	-2.5 ˚C to +2.5 ˚C
100 ˚C	4.279 mV	97.8 ˚C to 102.2 ˚C	97.2 ˚C to 102.7 ˚C
200 ˚C	9.288 mV	197.6 ˚C to 202.4 ˚C	197.1 ˚C to 202.9 ˚C
300 ˚C	14.862 mV	297.4 ˚C to 302.6 ˚C	296.9 ˚C to 303.1 ˚C
390 ˚C	20.255 mV	387.2 ˚C to 392.8 ˚C	387.2 ˚C to 392.8 ˚C
-100 ˚C	-3.379 mV	-102.8 ˚C to -97.2 ˚C	-103.3 ˚C to -96.7 ˚C
-200 ˚C	-5.603 mV	-203.6 ˚C to -196.4 ˚C	-204.1 ˚C to -195.9 ˚C

(4) Connect (K) compensation leads to each amp.

(5) Input the reference voltage signal for each range to the 0˚C reference temperature device (zero controller) according to the table below, then check that the level of measurement is within the rating.

M amp : Input voltage precision ratings (Type K)			
Temperature	Input voltage	Standard 1	Standard 2
0 ˚C	0.000 mV	-2.5 ˚C to +2.5 ˚C	-3 ˚C to +3 ˚C
1200 ˚C	48.838 mV	1195.1 ˚C to 1204.9 ˚C	1194.6 ˚C to 1205.4 ˚C
-190 ˚C	-5.730 mV	-185.6 ˚C to -194.4 ˚C	-185.1 ˚C to -194.9.9 ˚C

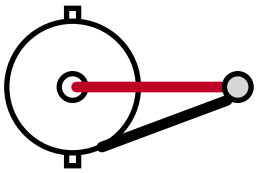
Note : If the above measurement is performed in the same measurement environment as the setup environment, the measurement results must be within the above "Standard 1".
If the measurement environment is different from the setup environment, the measurement results must be within the above "Standard 2".

6.3 Signal-to-Noise Ratio

Preparation

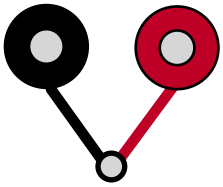
Prepare the short terminals shown below for shorting the + and - terminals for each channel of the target amp, and then short those terminals.

V amp, HSV amp



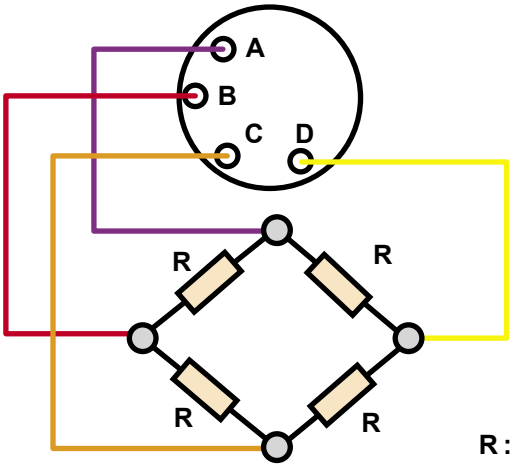
Make a short circuit between the "+" and "-" terminals.

M amp



Make a short circuit between the "+" and "-" terminals.

DCB amp

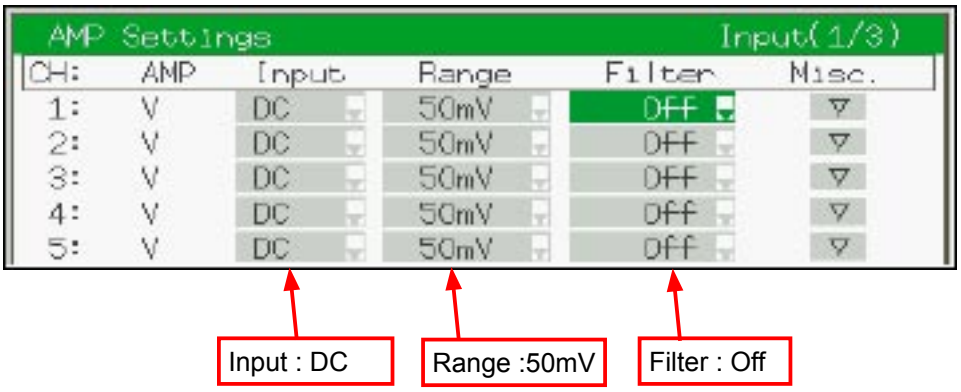


R : 350 Ω

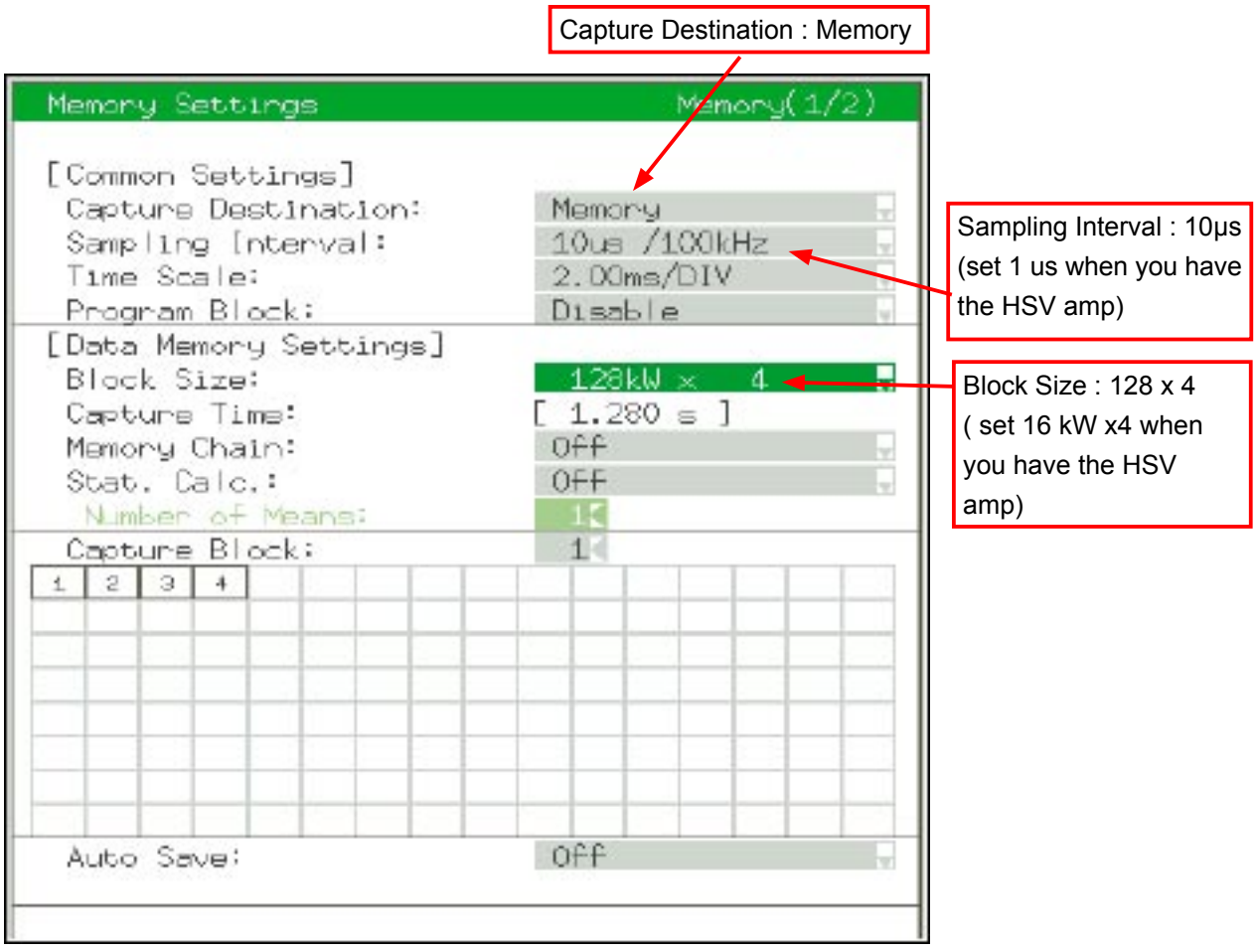
Note :The F/V amp does not require this test.

Setting Procedure

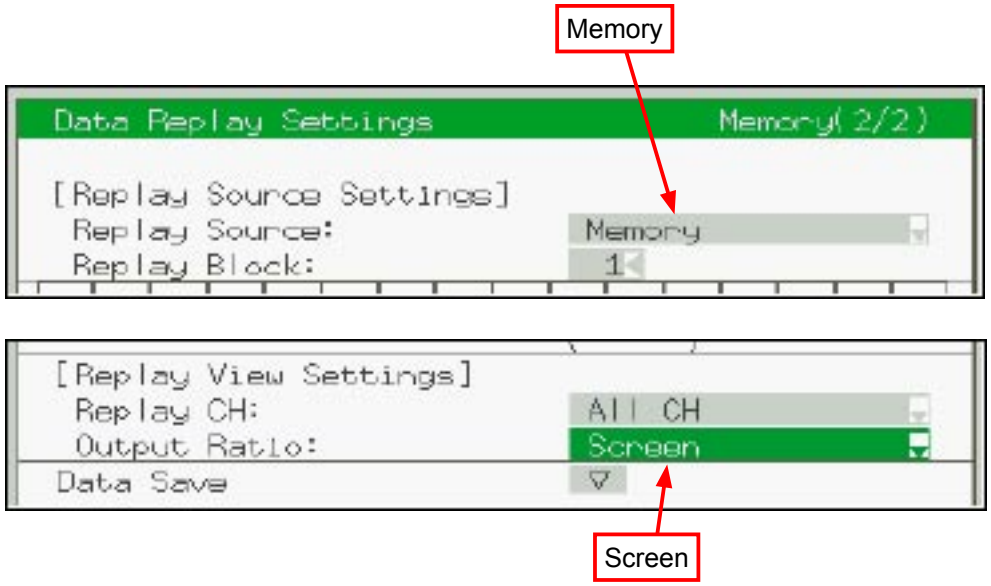
(1) Press the [INPUT] key to display the "AMP Settings" window as shown below, and then make the following settings.
Input : DC
Range : 50 mV
Filter : Off



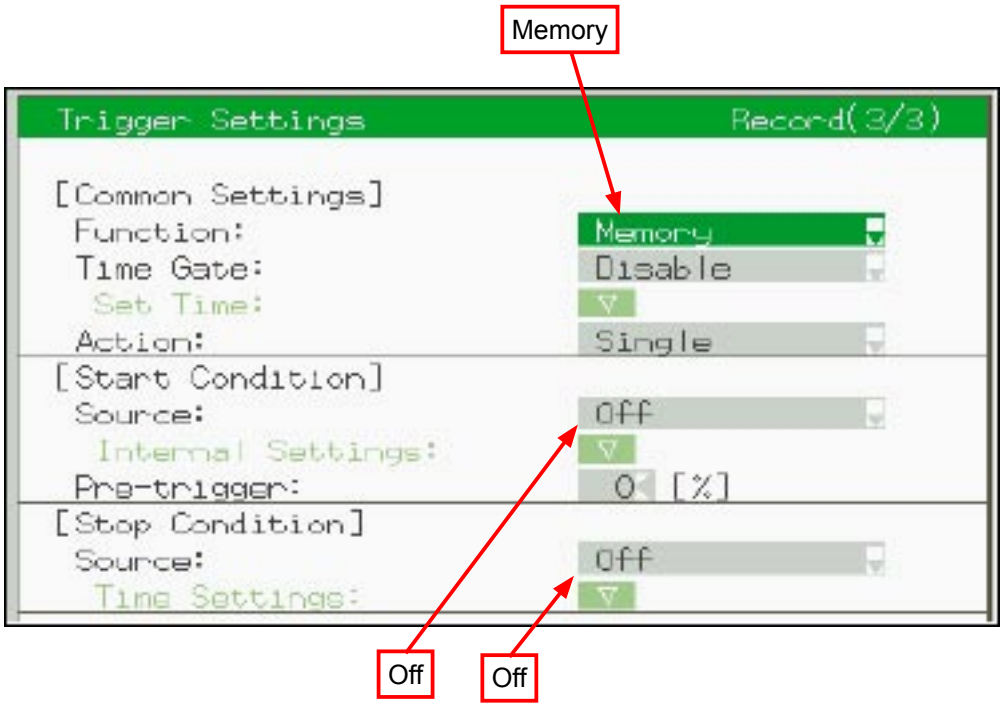
(2) Press the [MEMORY] key to display the "MEMORY Settings" window as shown below, and then make the following settings.
Capture Destination : Memory
Sampling Interval : 10µs (HSV amp: 1µs)
Block Size : 128 x 4 (HSV amp: 16kW x4)


Capture Destination : Memory
Memory Settings
Memory(1/2)
[Common Settings]
Capture Destination: Memory
Sampling Interval: 10us /100kHz
Time Scale: 2.00ms/DIV
Program Block: Disable
[Data Memory Settings]
Block Size: 128kW x 4
Capture Time: [1.280 s]
Memory Chain: Off
Stat. Calc.: Off
Number of Means: 1
Capture Block: 1
1 2 3 4
Auto Save: Off
Sampling Interval : 10µs (set 1 us when you have the HSV amp)
Block Size : 128 x 4 (set 16 kW x4 when you have the HSV amp)

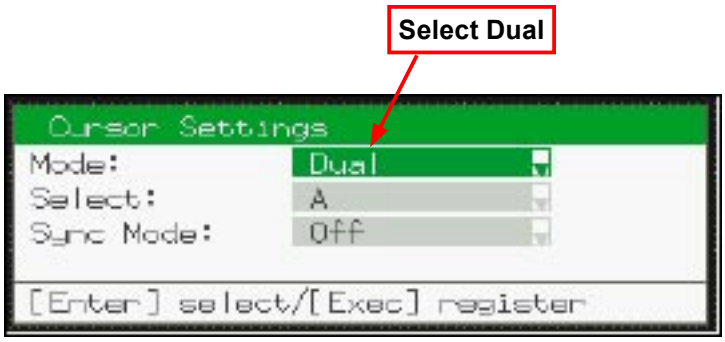
(3) Press the [MEMORY] key to display the "Data Replay Settings" window as shown below, and then make the following settings.
Replay Source : Memory
Output Ratio : Screen



(4) Press the [RECORD] key to display the "Trigger Settings" window as shown below, and then make the following settings.
Function : Memory
Start Condition Source : Off
Stop Condition Source: Off

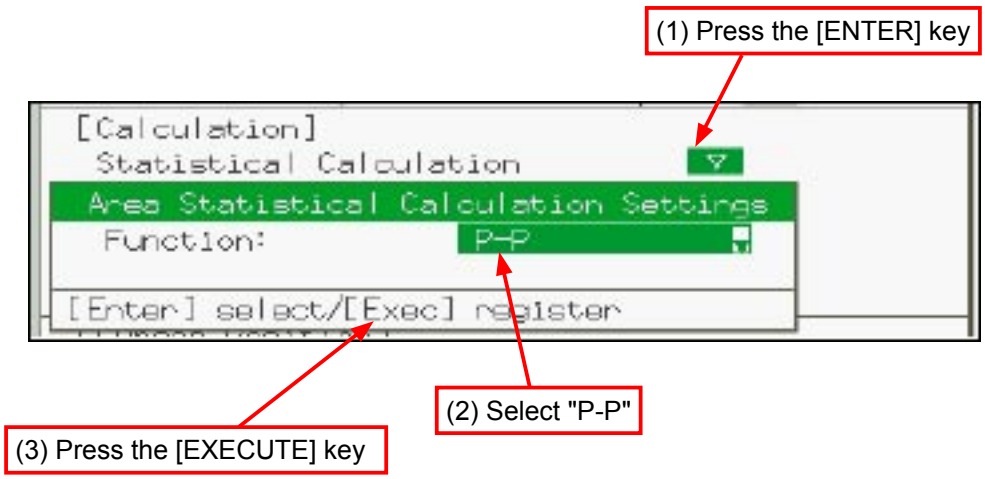


(5) Press the [CURSOR] key to display the "Cursor Settings" window as shown below, and then make the following settings.
Mode : Dual

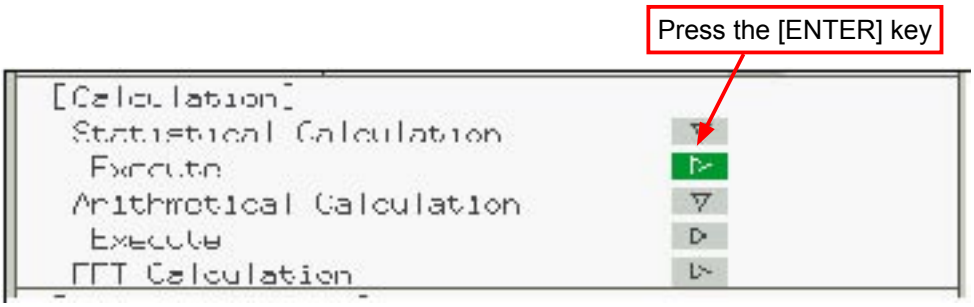


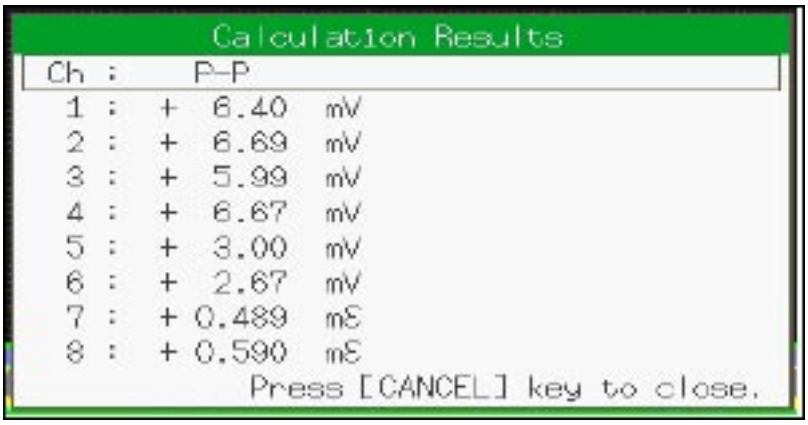
(6) Press the [EXECUTE] key to register the cursor settings.
Note : Two cursors are displayed.

(7) Press the [READOUT] key to display the "Readout Menu", select the "Statistical Calculation" window as shown below, and then make the following settings.
Function : P-P



(8) Select "Execute" and press the [ENTER] key to display the P-P values as shown below. Confirm that the values are within the ratings.





Measurement

(1) Use the short terminals to short the input terminals of all channels.

(2) Use the voltage generator to successively input the reference voltage signal for each range according to the table below, then check that the level of measurement is within the rating.

Input voltage precision ratings		
Amp	Range	Measurement Range
V-AMP	50 mV	-0.25 mV to +0.25 mV
	5 V	-0.25 V to +0.25 V
M-AMP	20 mV	-0.1 mV to +0.1 mV
	2 V	-0.01 V to +0.01 V
DCB-AMP	1 m strain	-0.05 m strain to +0.05 m strain
HSV-AMP	20 mV (20 mV/DIV)	-0.3 mV to +0.3 mV
	5 V (500 mV/DIV)	-0.075 V to +0.075 V

Note : Press the [SHIFT] key and then press the [REPLAY/EXIT] key to change the measurement range.
Before starting measurement, perform "Auto balance" when checking the DCB-AMP.
The checking procedure is described in "Measurement Accuracy".

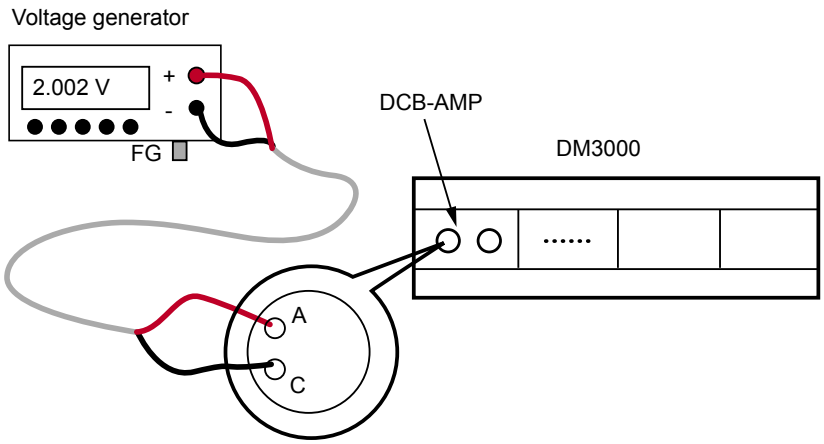
6.4 DC Bridge Voltage Measurement

Preparation

• Use a voltage generator (using four-digit settings).

Wiring connection

Connect the multi-meter to the DCB amp input terminal as shown below.



Measurement

(1) Check that the measurement voltage is within +2.003 V to -1.977 V.
(Manufacturing specification : 2 V ±0.15%)

6.5 Frequency and Filter Characteristics

Preparation

• Have on hand an oscillator capable of the types of output described below.
  Output waveforms : sine waves
  Frequency : 1.0 Hz to 10 MHz
• Mutually connect the GND terminals of the oscillator and FG terminal of the AC adapter before measurement.

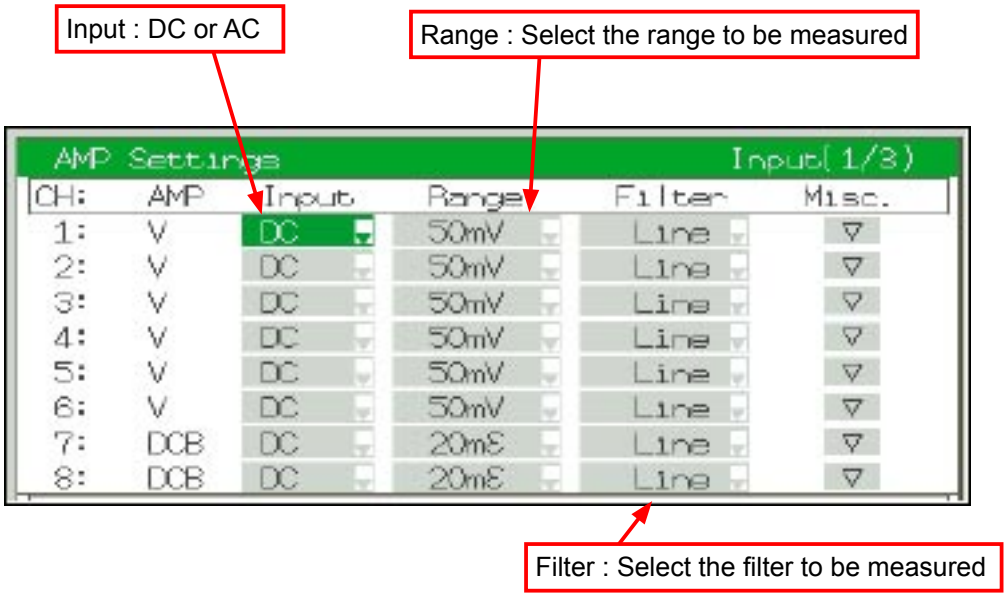
Wiring connection

Connect the oscillator to each amp input terminal.

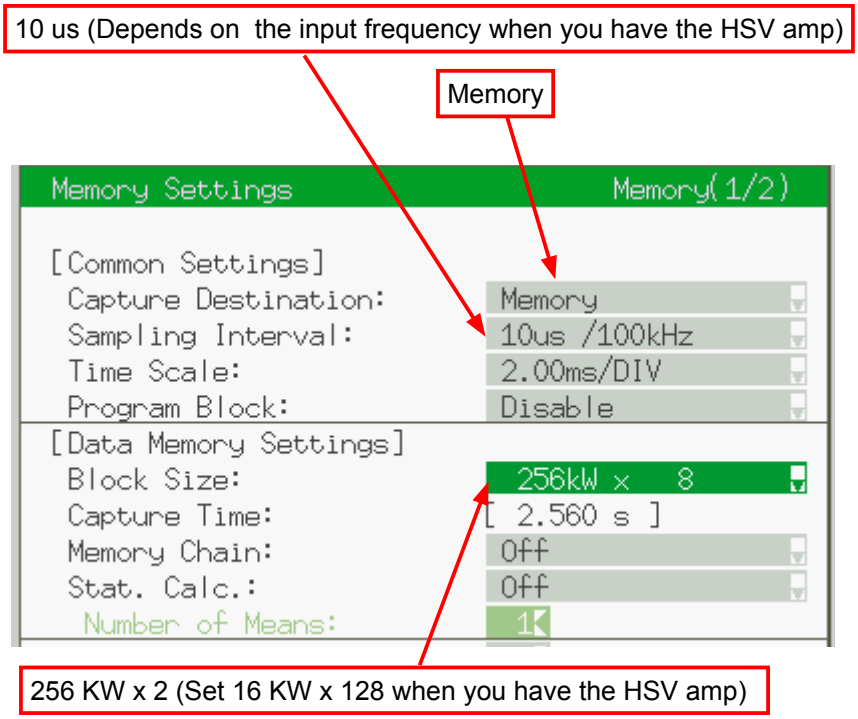
Setting procedure

(1) Press the [INPUT] key to display the "AMP Settings" window as shown below, and then make the following settings.
  AMP : V, M, DCB, F/V or HSV (select the measuring amp)
  Input : DC or AC (depend on input frequency)
  Range : Select the range to be measured
  Filter : Select the filter to be measured

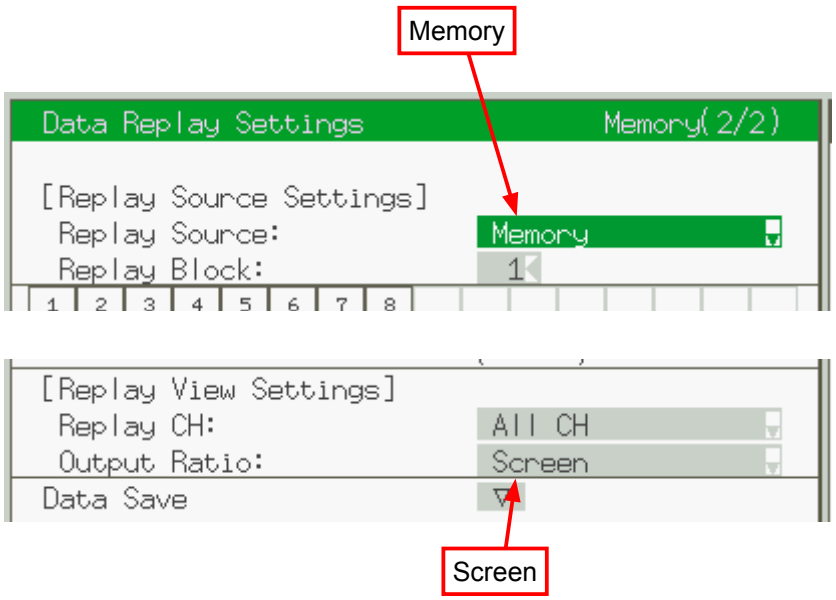
Amp	Range	Span	Input signal
V-amp	5 V	-2.500 to +2.500 V	5 V p-p
M-amp	2 V	-1.0000 to +1.0000 V	2 V p-p
DCB-amp	20 m strain	-10.000 to +10.000 m strain	20 mV p-p
HSV-amp	2 V (200 mV/DIV)	-1.0000 to +1.0000 V	2 V p-p


Input : DC or AC
Range : Select the range to be measured
AMP Settings
Input(1/3)
CH: AMP Input Range Filter Misc.
1: V DC 50mV Line
2: V DC 50mV Line
3: V DC 50mV Line
4: V DC 50mV Line
5: V DC 50mV Line
6: V DC 50mV Line
7: DCB DC 20mS Line
8: DCB DC 20mS Line
Filter : Select the filter to be measured

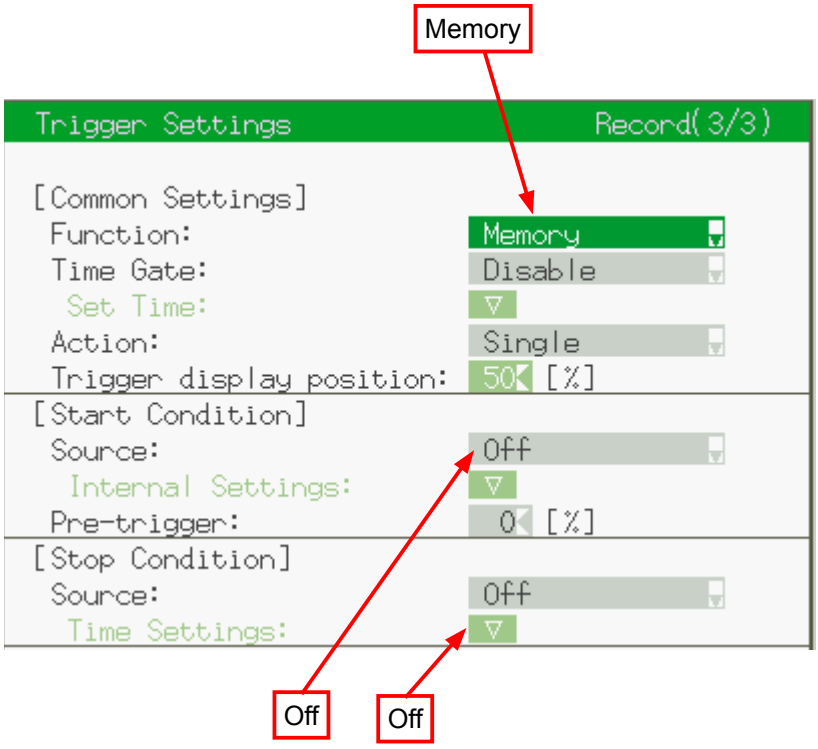
(2) Press the [MEMORY] key to display the "Memory Settings" window as shown below, and then make the following settings.
Capture Destination : Memory
Sampling Interval : 10 us (Depends on the input frequency when you have the HSV amp)
Block Size : 256 KW x 2 (Set 16 KW x 128 when you have the HSV amp)



(3) Press the [MEMORY] key to display the "Data Replay Settings" window as shown below, and then make the following settings.
Replay Source : Memory
Output Ratio : Screen



(4) Press the [RECORD] key to display the "Trigger Settings" window as shown below, and then make the following settings.
Function : Memory
Start Condition Source : Off
Stop Condition Source: Off



Measurement procedure

(1) Input the reference signal for each amp according to the table below, and then check that the measured amplitude is within the rating when compared with the amplitude during reference signal input.

V amp

Amp settings				Generator output settings			Rating	
Input	Range	Filter	Span	Frequency	AMPTD	FCTN	Rating (%)	Rating (5 V input)
DC	5 V	Line	-2.500 to +2.500 V	1.5 Hz	5 V p-p	Sine wave	55% to 85%	2.75 V to 4.25 V
		5 Hz		5 Hz				
		10 Hz		10 Hz				
		50 Hz		50 Hz			60% to 80%	3 V to 4 V
		500 Hz		500 Hz				
		5 kHz		5 kHz				
		50 kHz		50 kHz				
		OFF		200 kHz			70% to 112%	3.5 V to 5.6 V
AC		OFF		10 Hz			60% to 80%	3 V to 4 V

M amp

Amp settings				Generator output settings			Rating	
Input	Range	Filter	Span	Frequency	AMPTD	FCTN	Rating (%)	Rating (2 V input)
DC	2 V	Line	-1.0000 to +1.0000 V	1.5 Hz	2 V p-p	Sine wave	55% to 85%	1.1 V to 1.7 V
		5 Hz		5 Hz				
		10 Hz		10 Hz				
		30 Hz		30 Hz			60% to 80%	1.2 V to 1.6 V
		50 Hz		50 Hz				
		500 Hz		500 Hz				
		5 kHz		5 kHz				
		OFF		20 kHz			65% to 112%	1.3 V to 2.24 V
AC		OFF		10 Hz			60% to 80%	1.2 V to 1.6 V

DCB amp

Amp settings				Generator output settings			Rating	
Input	Range	Filter	Span	Frequency	AMPTD	FCTN	Rating (%)	Rating (20 m input)
DC	20 m strain	Line	-10.000 to +10.000 m strain	1.5 Hz	20 mV p-p	Sine wave	55% to 85%	11 m to 17 m strain
		10 Hz		10 Hz			60% to 80%	12 m to 16 m strain
		30 Hz		30 Hz				
		100 Hz		100 Hz				
		300 Hz		300 Hz				
		1 kHz		1 kHz				
		OFF		20 Hz			70% to 112%	14 m to 22.4 m strain

HSV amp

Amp settings					Generator output settings			Rating	
Input	Range	Filter	Span	Sampling interval	Frequency	AMPTD	FCTN	Rating (%)	Rating (2 V input)
DC	2 V (200 mV/ DIV)	Line	-1.0000 to +1.0000 V	200 µsec	1.5 Hz	2 V p-p	Sine wave	55% to 85%	1.1 V to 1.7 V
		5 Hz			5 Hz				
		50 Hz		10 µsec	50 Hz				
		500 Hz			500 Hz				
		5 kHz		50 nsec	5 kHz				
		50 kHz			50 kHz				
		500 kHz			500 kHz				
		OFF		100 µsec	10 MHz			70% to 112%	1.4 V to 2.24 V
AC		OFF		200 µsec	10 Hz			80% to 100%	1.6 V to 2 V

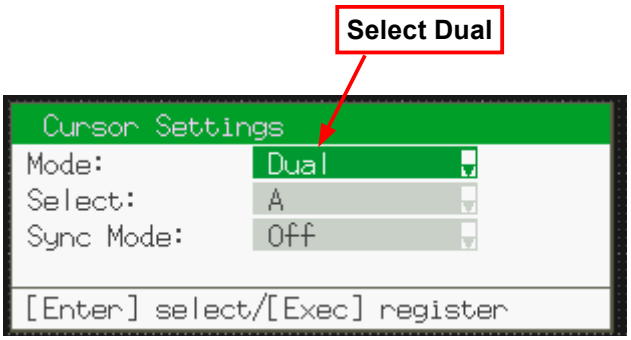
Note: 10 MHz frequency when the filter off
When you connect the cables to each amp in parallel, the cable resistance and the input resistance of each amp will cause a decrease in amplotude.

(2) Press the [START/STOP] key then wait until the "Finished" message is displayed.

(3) Press the [START/STOP] key to stop the measurement.

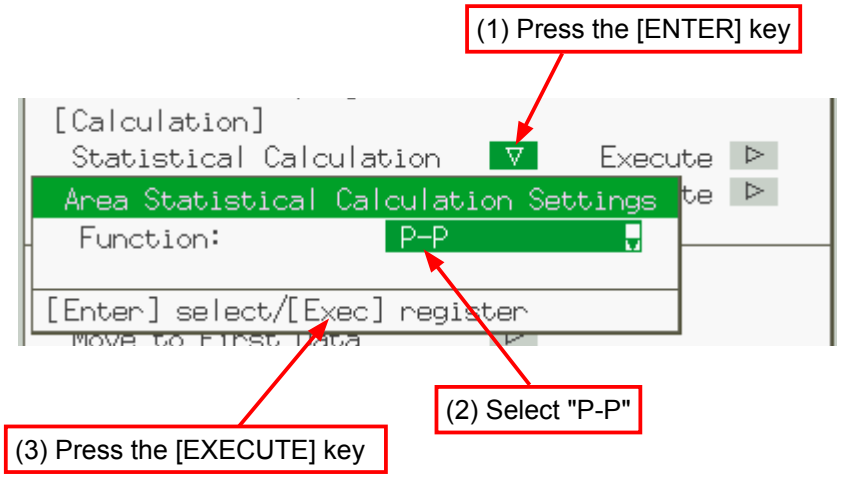
(4) Press the [REPLAY/EXIT] key to display the waveform.

(5) Press the [CURSOR] key to display the "Cursor Settings" window as shown below, and then make the following settings.
Mode : Dual



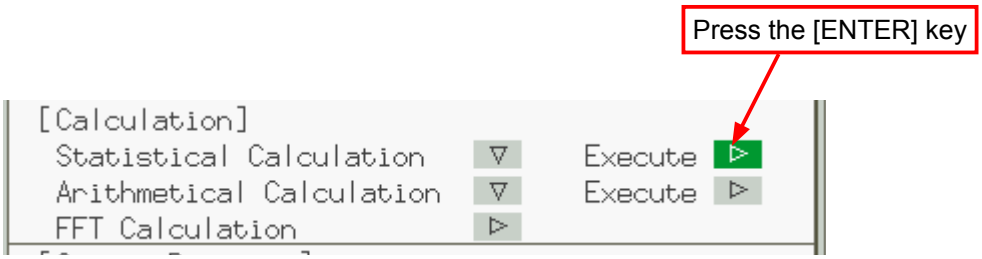
(6) Press the [EXECUTE] key to register the cursor settings.
Note : Two cursors are displayed.

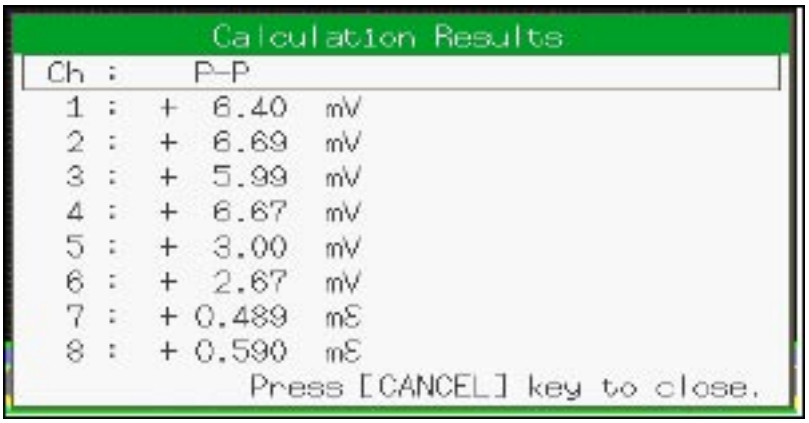
(7) Press the [READOUT] key to display the "Readout Menu", select the "Statistical Calculation" window as shown below, and then make the following settings.
Function : P-P



(8) Select "Execute" and then press the [ENTER] key to display the P-P values as shown.
Confirm that the values are within the ratings.

Note : Press the [SHIFT] key and then press the [REPLAY/EXIT] key to change the measurement range.





6.6 Checking the F/V-Amp Input Change (GL1000)

Preparation

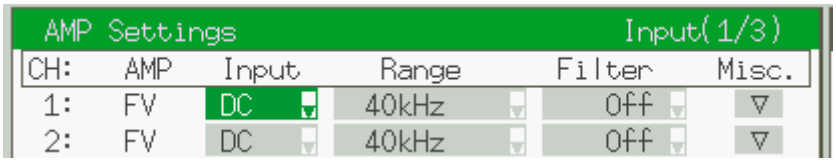
• Use a signal generator.

Wiring connection

Connect the signal generator to the F/V-amp. Input a rectangular waveform to the F/V-amp.

Setting Procedure

(1) Press the [INPUT] key to display the "AMP Settings" window as shown below, and then make the following settings.
Range : 40 kHz
Filter : Off



Checking procedure

(1) Make the following settings.
Input : DC
Range : 40 kHz
Filter : Off

(2) Start to measure the waveform in the recorder mode.

(3) Input the reference signal for the F/V-amp as shown below.
Function generator output
AMPTD : ±1 V
FCTN : 20 kHz rectangular waveform (⎍)

(4) Start to measure the waveform in the recorder mode, and then check that the measured value is 20 kHz.

(5) Input the reference signal for the F/V-amp as shown below.
Function generator output
AMPTD : ±1.5 to 3.5 V (Offset : +2.5 V)
FCTN : 20 kHz rectangular waveform (⎍)

(6) Measure the waveform in the recorder mode, and then check that the measured value is 0 kHz.

(7) Press the [INPUT] key to display the "AMP Settings" window make the following settings, and then check that the measured value is 20 kHz.
Input : 0C
Range : 40 kHz
Filter : Off

(8) Measure the waveform in the recorder mode, and then check that the measured value is 20 kHz.

6.7 Checking the Logic-Amp

Preparation

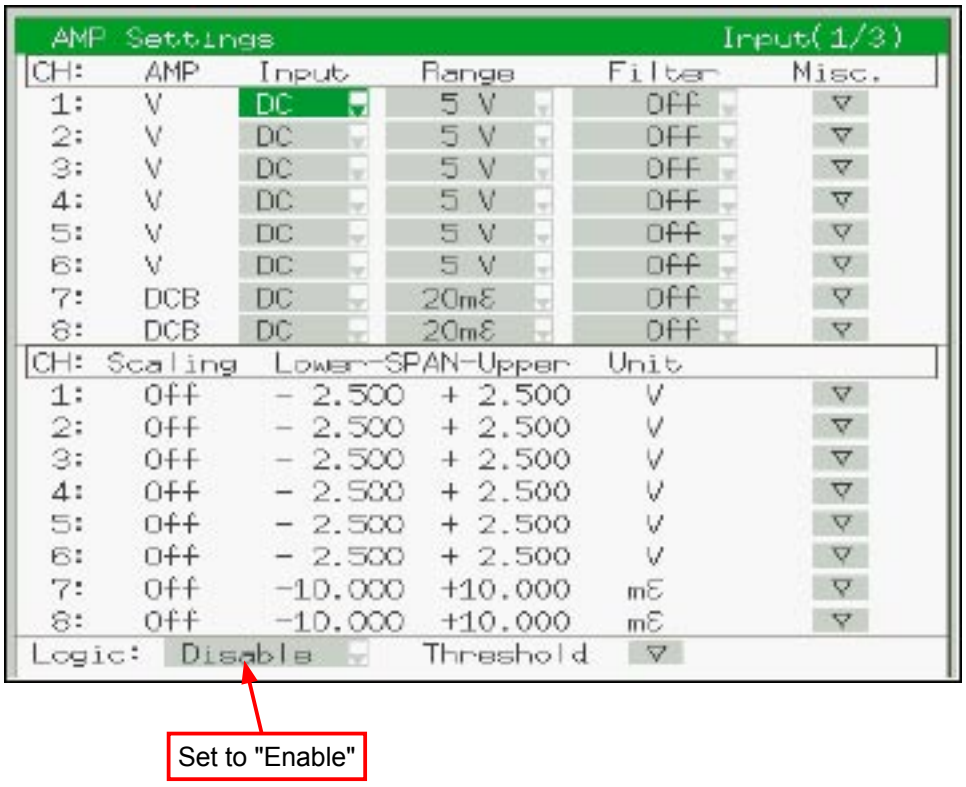
• Use a signal generator.

Wiring connection

Connect the signal generator to the logic amp. Input a rectangular waveform to the logic amp.

Setting Procedure

(1) Press the [INPUT] key to display the "AMP Settings" window as shown below, and then make the following settings.
Logic : Enable


AMP Settings
Input(1/3)
CH: AMP Input Range Filter Misc.
1: V DC 5 V Off
2: V DC 5 V Off
3: V DC 5 V Off
4: V DC 5 V Off
5: V DC 5 V Off
6: V DC 5 V Off
7: DCB DC 20mE Off
8: DCB DC 20mE Off
CH: Scaling Lower-SPAN-Upper Unit
1: Off - 2.500 + 2.500 V
2: Off - 2.500 + 2.500 V
3: Off - 2.500 + 2.500 V
4: Off - 2.500 + 2.500 V
5: Off - 2.500 + 2.500 V
6: Off - 2.500 + 2.500 V
7: Off -10.000 +10.000 mE
8: Off -10.000 +10.000 mE
Logic: Disable Threshold
Set to "Enable"

(2) Set the threshold level (check for +1.4 V / +2.5 V / +5V)

(3) Press the [RECORD] key to display the "Format Settings" window, and then make the following settings.
Group A : Zone 1
Group B : Zone 2
Group C : Zone 3
Group D ; Zone 4
(C and D are for the 16-channel model only)

Points to check

(1) Set the threshold level to +1.4 V (TTL).
Input the signal to the logic amp.
Check the level of the signal.

Input Voltage	Level
1 V	L
2 V	H

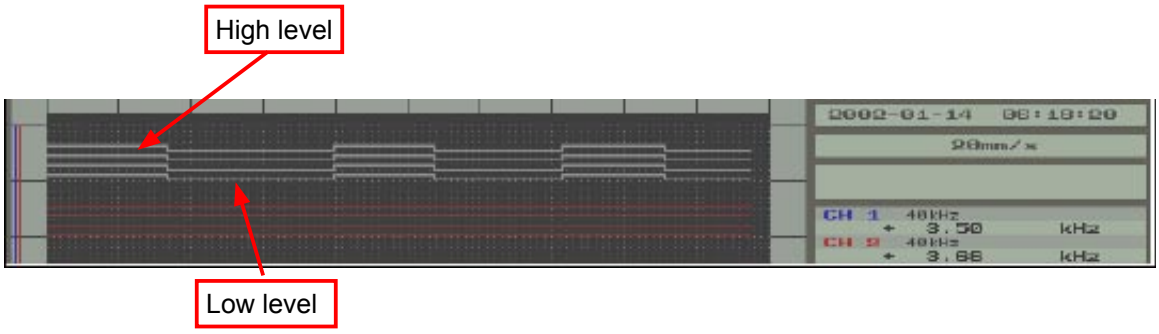
(2) Set the threshold level to +2.5 V (TTL).
Input the signal to the logic amp.
Check the level of the signal.

Input Voltage	Level
2 V	L
3 V	H

(3) Set the threshold level to +5.0 V (TTL).
Input the signal to the logic amp.
Check the level of the signal.

Input Voltage	Level
4 V	L
6 V	H

Note : All the above procedures should be performed using the same setting conditions for all groups.



7. PARTS LISTS

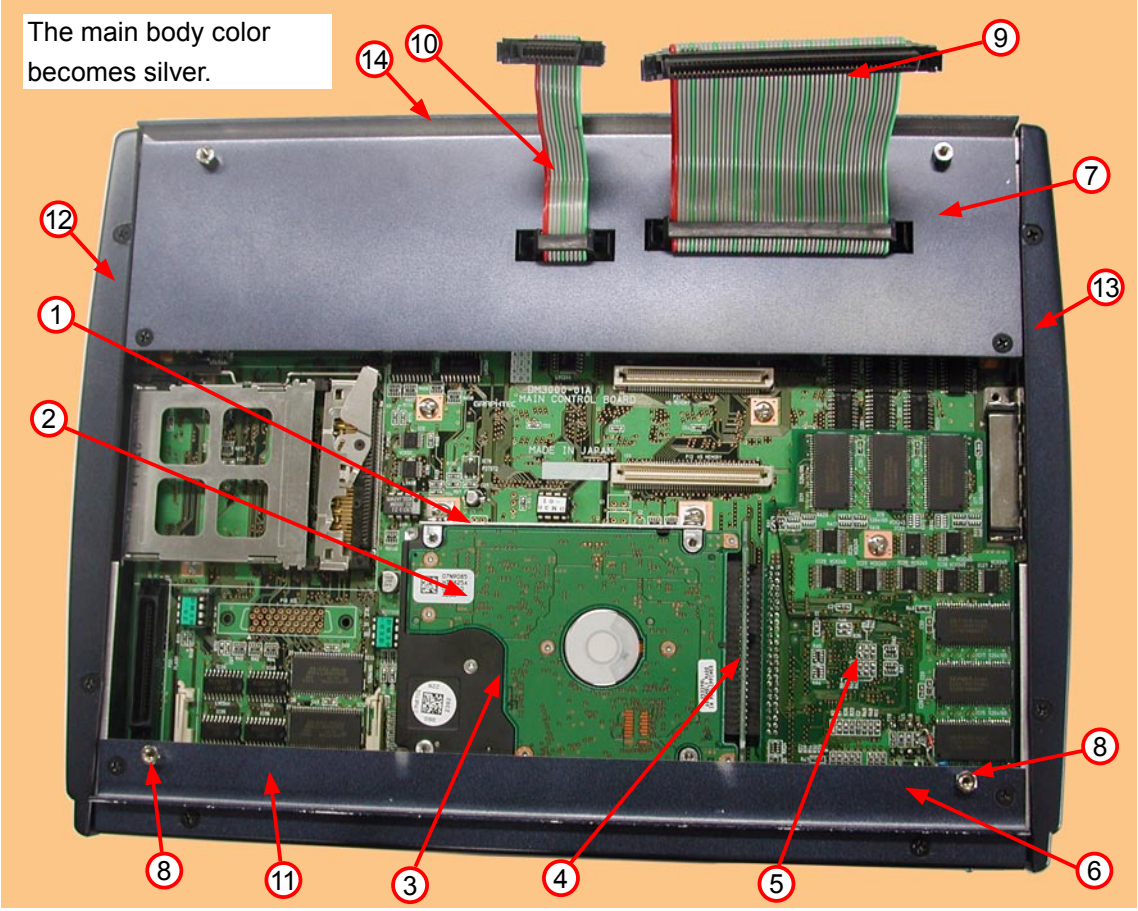
7.1 RECOMMENDED PARTS LISTS

Part No.	Description	QTY	Remarks
790530720	MAIN CONTROL BOARD FOR GL1000	1	GL1000
790530721	MAIN CONTROL BOARD FOR GL1100	1	GL1100
770530102	AMP MOTHER BOARD FOR GL1000	1 or 2	8CH : 1, 16CH : 2 (GL1000)
770530118	AMP MOTHER BOARD FOR GL1100	1 or 2	8CH : 1, 16CH : 2 (GL1100)
770530103	AMP DC/DC 1 BOARD	1 or 2	8CH : 1, 16CH : 2
770530104	AMP DC/DC 2 BOARD	1 or 2	8CH : 1, 16CH : 2
770530106	16CH CONTROL BOARD FOR GL1000	1	16CH (GL1000)
770530116	16CH CONTROL BOARD FOR GL1100	1	16CH (GL1100)
770530111	FAN MOTOR ASSY FOR GL1000	1 or 2	8CH : 1, 16CH : 2 (GL1000)
770530119	FAN MOTOR ASSY FOR GL1100	1 or 2	8CH : 1, 16CH : 2 (GL1100)
500051537	RC60-24B	1 or 2	AC ADAPTER (JAPAN)
500051394	PW-070A-1Y24D0	1 or 2	AC ADAPTER(OTHER)
795001070	GL10-VAMP FOR GL1000	1	GL1000
795001071	GL10-MAMP FOR GL1000	1	GL1000
795001073	GL10-F/VAMP FOR GL1000	1	GL1000
795001074	GL10-DCBAMP FOR GL1000/1100	1	GL1000/GL1100
795001072	GL11-MAMP FOR GL1100	1	GL1100
795001075	GL11-HSV AMP FOR GL1100	1	GL1100
790530722	LOGIC AMP	1	
500051411	AA084VC01	1	LCD
500051412	S-12613-7M	1	DC-AC INVERTER
790530700	LCD & KEY BOARD	1	DM3000-04A ASSY
790530701	LCD & KEY RELAY BOARD	1	DM3000-03A ASSY
790530702	LCD RELAY BOARD	1	DM3000-05A ASSY
790530703	LCD POWER BOARD	1	DM3000-23A ASSY
500003271	LTP2442D-C832	1	PRINTER UNIT
790530704	PRINTER CONTROL BOARD	1	DM3000-06A ASSY
790530705	PRINTER KEY BOARD	1	DM3000-21A ASSY
500051399	IC25N040ATCS04-0	1	HDD
500051647	IC25N040ATMR04-0	1	HDD (WHEN STOCK OF THE ABOVE HDD RUN OUT)
790530706	HDD CONTROL BOARD	1	DM3000-08A ASSY
790530707	HDD RELAY BOARD	1	DM3000-22A ASSY
770530320	DC POWER BOARD	1	DM3000-09 ASSY

7.2 Parts Lists

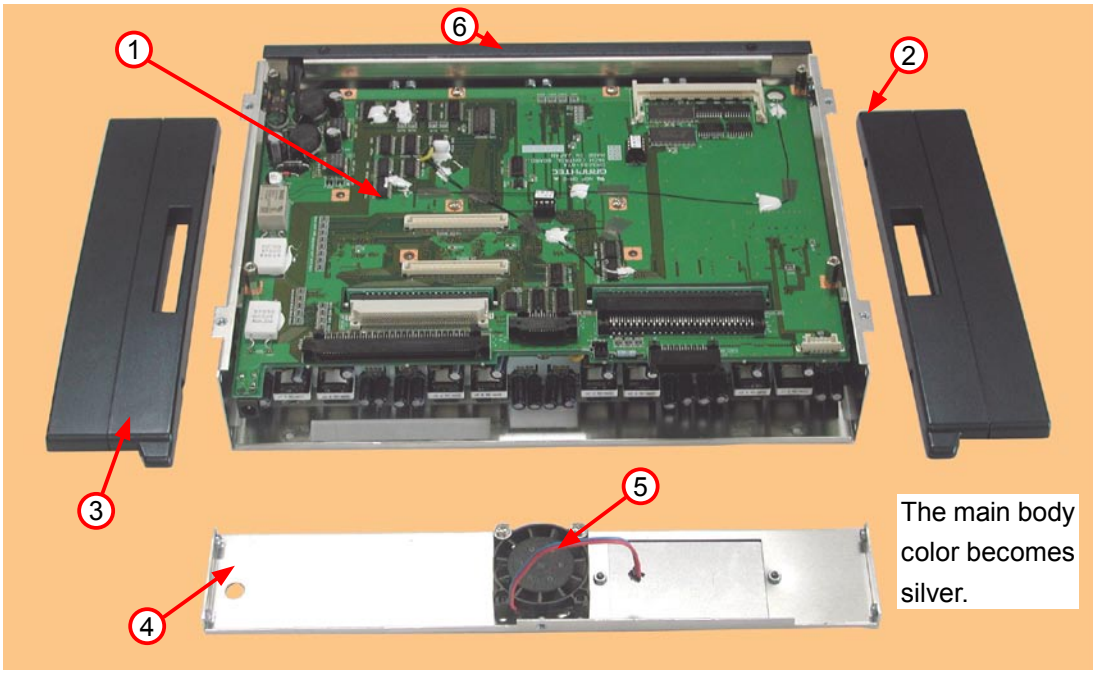
7.2.1 8-ch unit parts

No.	Part No.	Description	QTY	Remarks
1	790530720	Main Control Board for GL1000	1	
	790530721	Main Control Board for GL1100	1	
2	500051399	IC25N040ATCS04-0	1	HDD
	500051647	IC25N040ATMR04-0	1	After run out above HDD
3	607308300	HDD Bracket	2	
4	790530707	HDD Relay Board	1	DM3000-22A ASSY
5	790530706	HDD Control Board	1	DM3000-08A ASSY
6	607302300	Front Joint Cover	1	For 16CH unit
7	607302310	Rear Joint Cover	1	For 16CH unit
8	393230050	BSB-305	4	For 16CH unit
9	690630510	FC,DM3000-01	1	For 16CH unit
10	690630520	FC,DM3000-02	1	For 16CH unit
11	607302050	Front Cover for 8CH Unit	1	
12	607302010	Left Side Cover	1	
13	607302020	Right Side Cover	1	
14	607302060	Rear Panel for 8CH Unit	1	

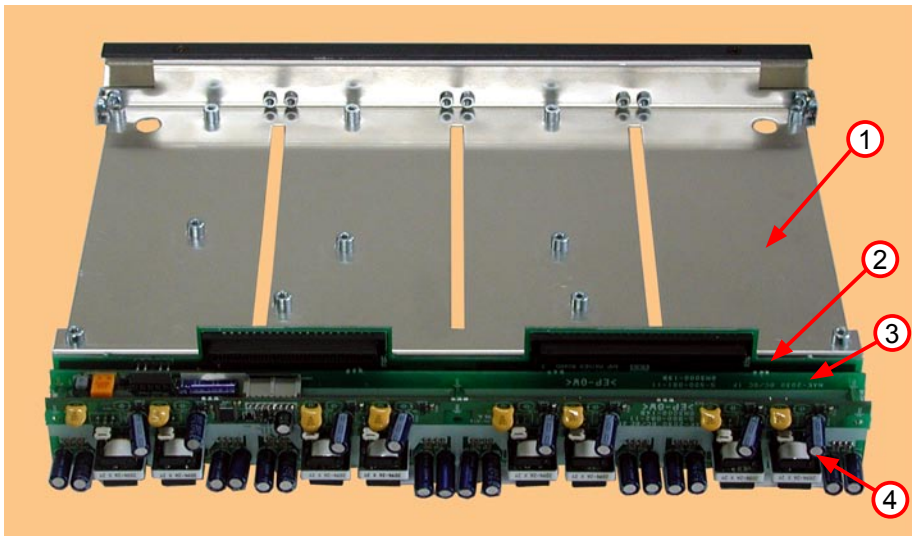


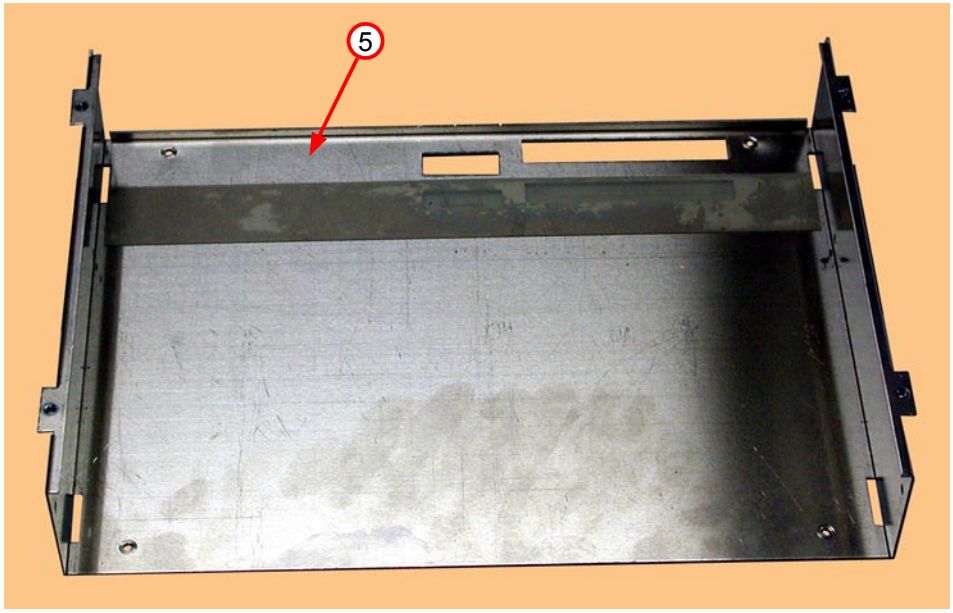
7.2.2 16-ch unit parts

No.	Part No.	Description	QTY	Remarks
1	770530106	16CH Control Board for GL1000	1	For 16CH unit (Same as DM3100)
	770530106	16CH Control Board for GL1100	1	For 16CH unit (Same as DM3300)
2	607302010	Left Side Cover	1	
3	607302020	Right Side Cover	1	
4	607302210	Rear Panel for 16CH Unit	1	For 16CH unit
5	770530111	Fan Motor Assy for GL1000	1	Same as DM3100
6	770530119	Fan Motor Assy for GL1100	1	Same as DM3300
	607302230	Front Cover for 16CH Unit		



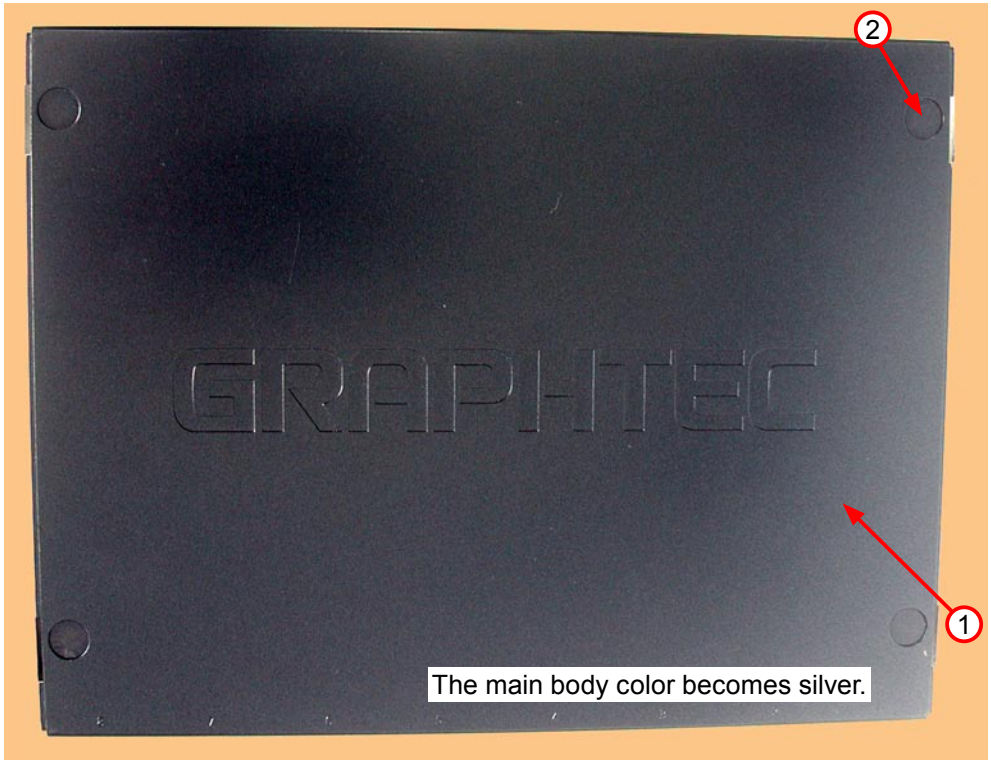
No.	Part No.	Description	QTY	Remarks
1	607300040	Middle Chassis	1	
2	770530102	Amp Mother Board for GL1000	1	Same as DM3100
	770530118	Amp Mother Board for GL1100	1	Same as DM3300
3	770530103	Amp DC/DC 1 Board	1	
4	770530104	Amp DC/DC 2 Board	1	
5	790530709	16CH Unit Top Chassis Assy	1	For 16 CH unit





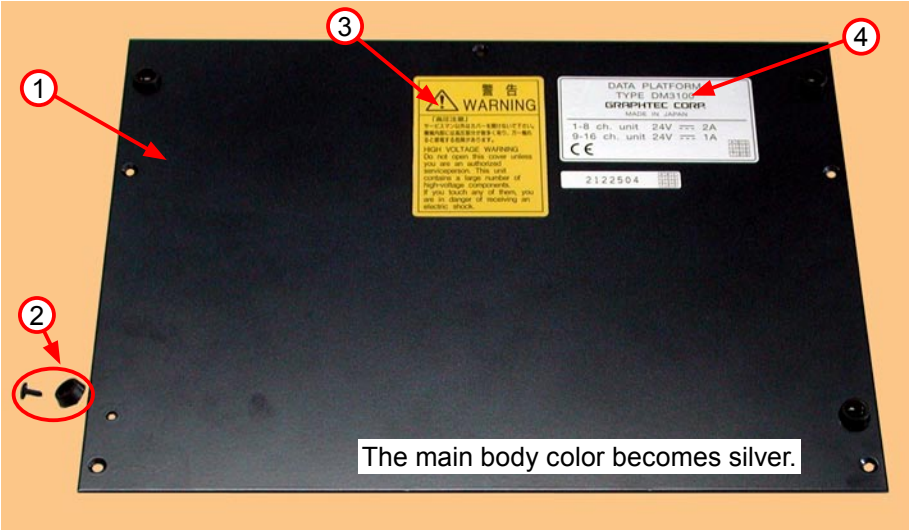
7.2.3 Top cover parts

No.	Part No.	Description	QTY	Remarks
1		Top Cover Assy	1	
2	607302420	Top Cover Screw Label	4	



7.2.4 Bottom cover parts

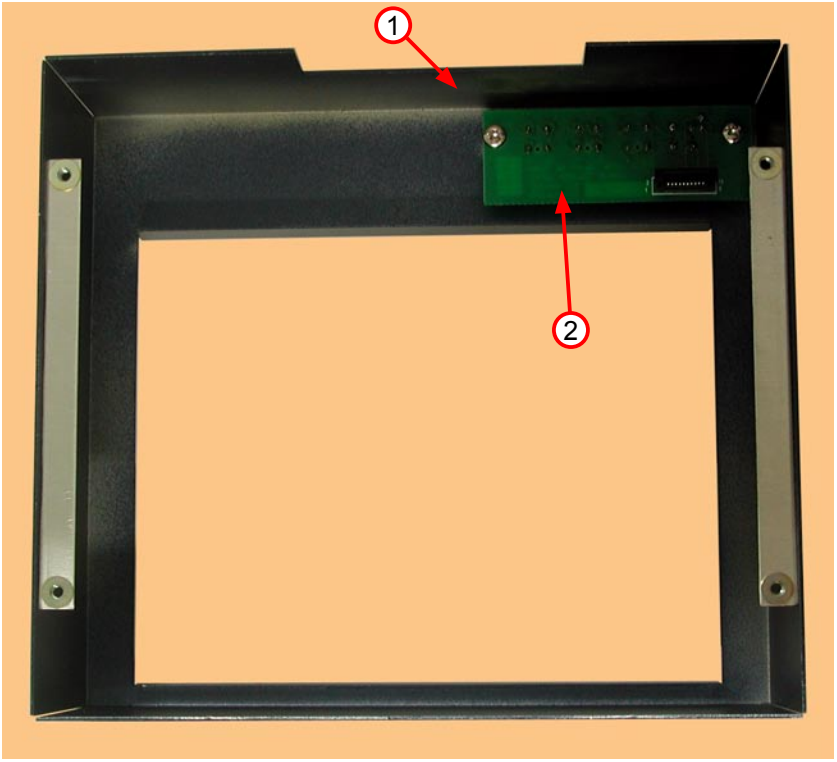
No.	Part No.	Description	QTY	Remarks
1	607302100	Bottom Cover	1	
2	363111041	Foot CP-30-FF-13	4	
3	601900150	Warning label	1	
4	607302500	8CH Model Label for GL1000	1	For 8CH unit (GL1000)
	607302600	16CH Model Label for GL1000	1	For 16CH unit (GL1000)
	607302510	8CH Model Label for GL1100	1	For 16CH unit (GL1100)
	607302610	16CH Model Label for GL1100	1	For 16CH unit (GL1100)



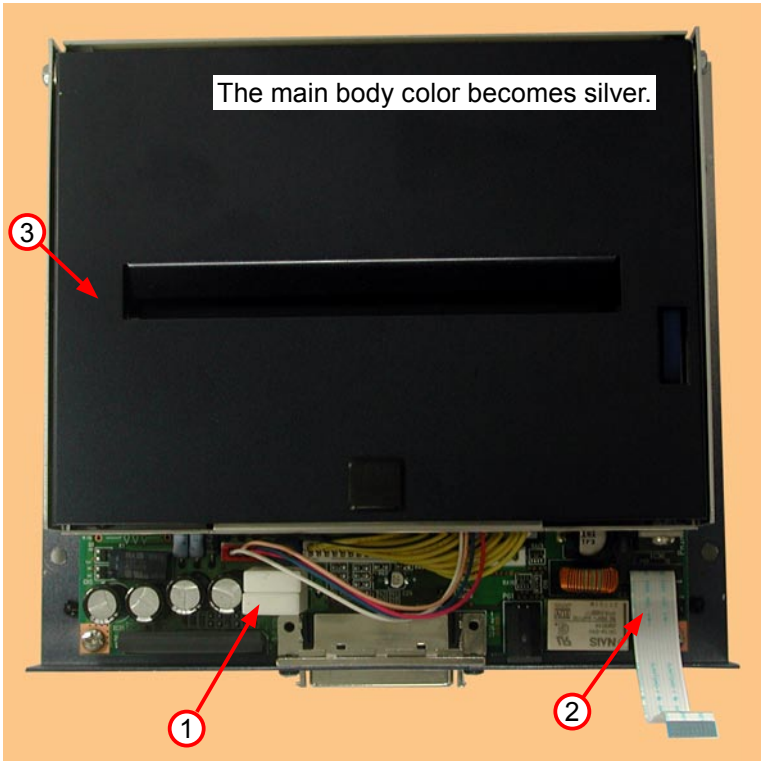
7.2.5 Printer parts

No.	Part No.	Description	QTY	Remarks
1	607304200	Base Plate	1	
2	363111041	Foot CP-30-FF-13	4	
3	607308260	Printer Model Label	1	

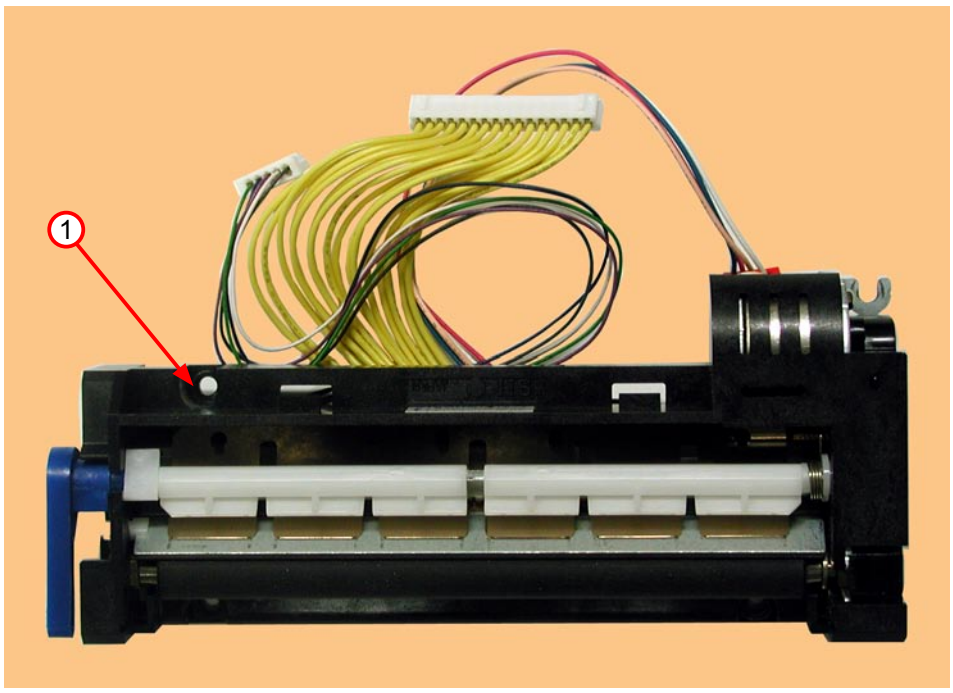
No.	Part No.	Description	QTY	Remarks
1	607304210	Cover	1	
2	790530705	PRINTER KEY BOARD	1	DM3000-21A ASSY

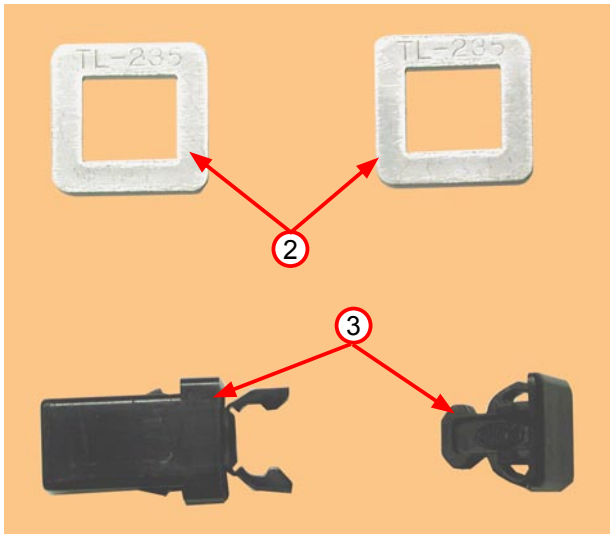


No.	Part No.	Description	QTY	Remarks
1	790530704	PRINTER CONTROL BOARD	1	DM3000-06A ASSY
2	690630540	Flexible Cable, DM3000-04	1	
3	607304250	Printer Cover	1	



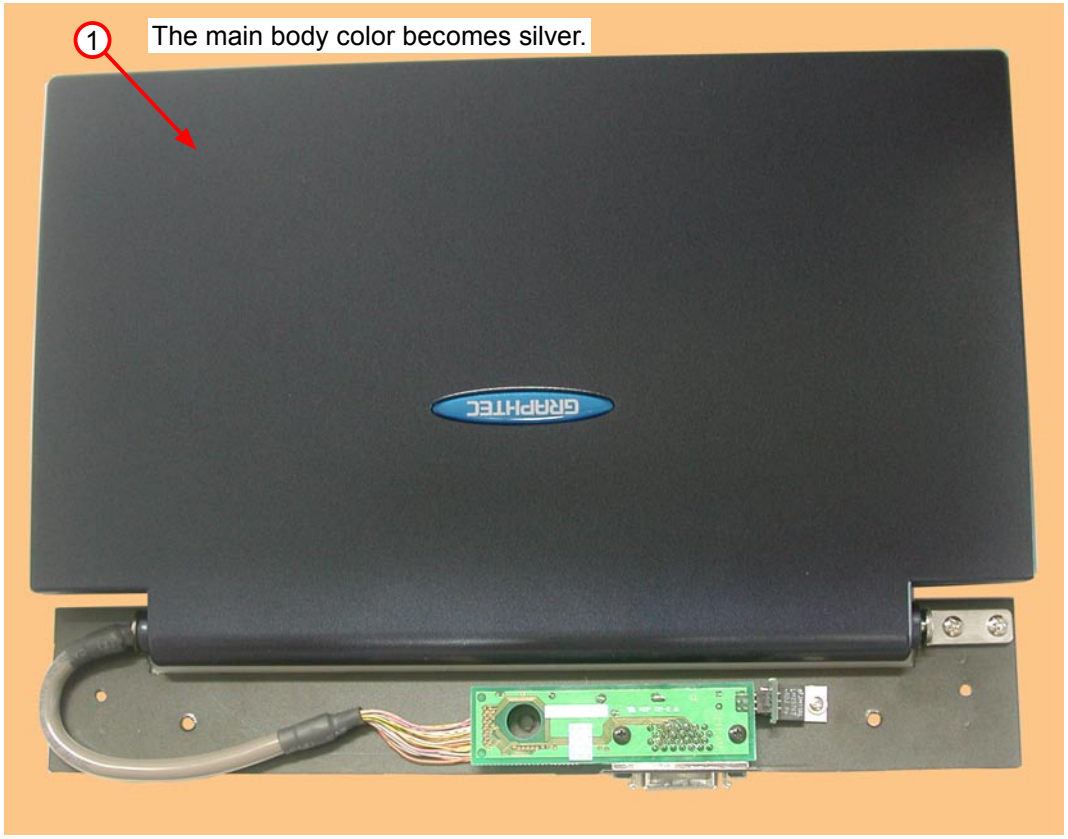
No.	Part No.	Description	QTY	Remarks
1	500003271	LTP2442D-C832	1	PRINTER UNIT
2	301211002	Spacer TL-235-6	2	
3	301211001	Mini latch TL-297-2	1	



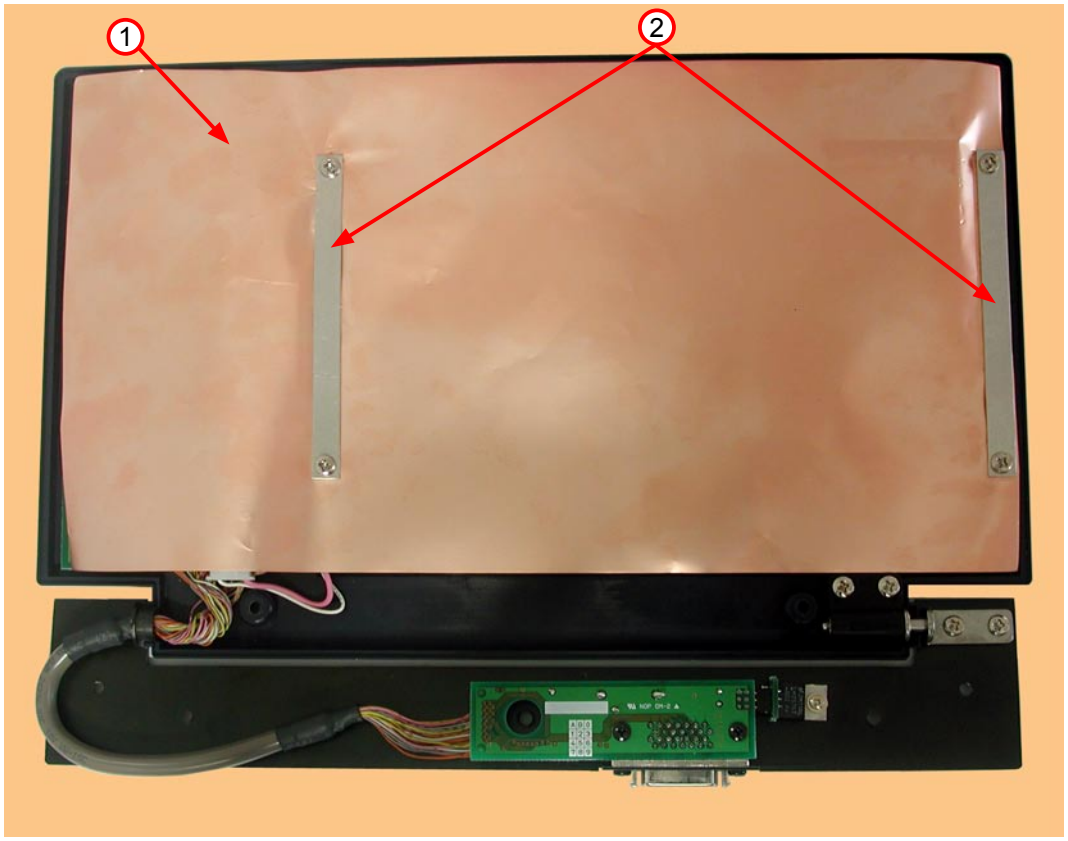


7.2.6 Monitor parts

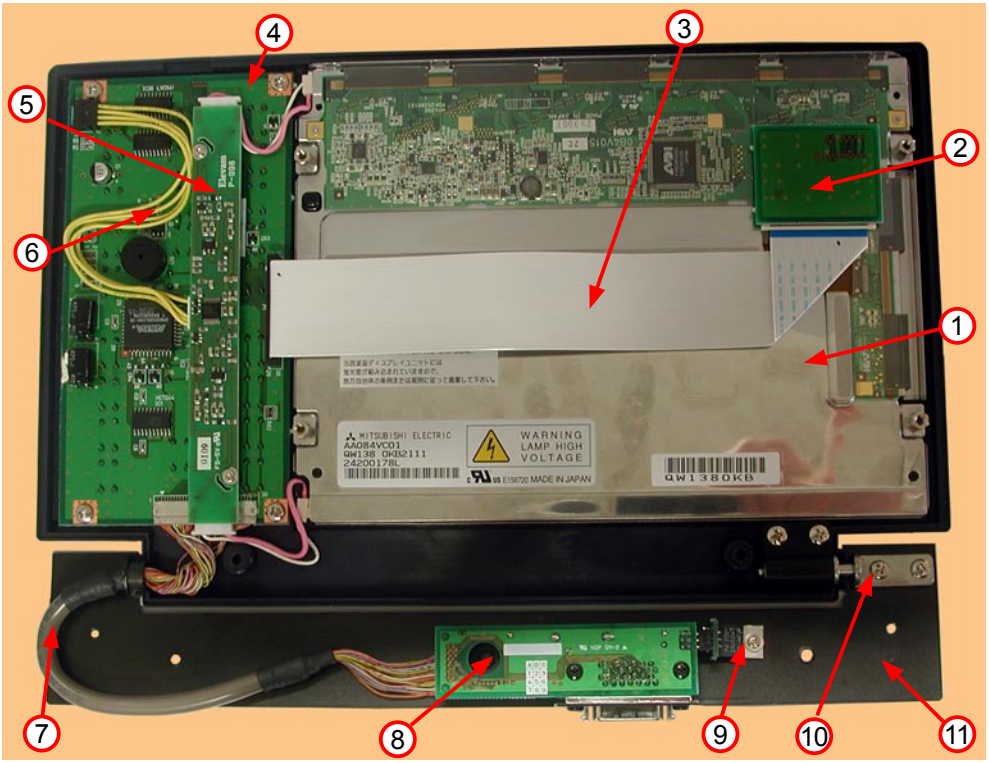
No.	Part No.	Description	QTY	Remarks
1	790530710	Control Sub-cover ASSY	1	



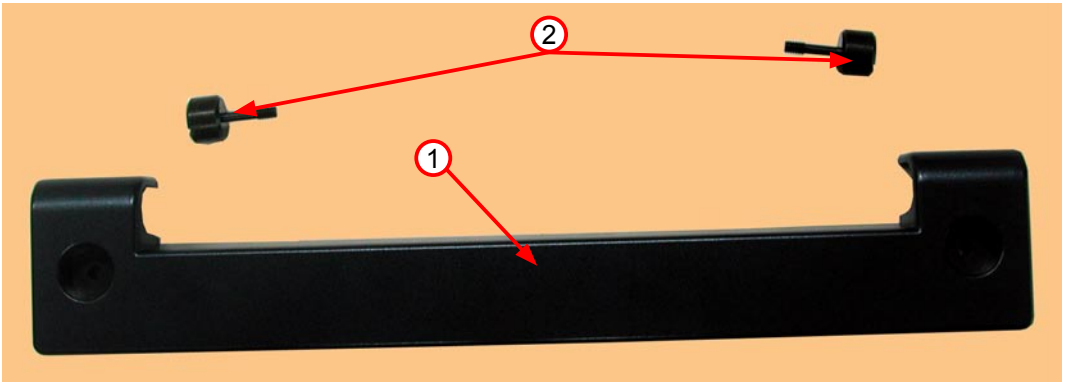
No.	Part No.	Description	QTY	Remarks
1	607308190	Monitor Shield	1	
2	607308180	Shield Stopper Plate	2	



No.	Part No.	Description	QTY	Remarks
1	500051411	AA084VC01	1	LCD
2	790530702	LCD Relay Board	1	DM3000-05A ASSY
3	690630530	FC,DM3000-03	1	Flexible Cable
4	790530700	LCD & Key Board	1	DM3000-04A ASSY
5	500051412	S-12613-7M	1	DC-AC Inverter
6	690630080	CA, DM3000-08	1	
7	690630071	CA, DM3000-07A	1	
8	790530701	LCD & Key Relay Board	1	DM3000-03A ASSY
9	790530703	LCD POWER BOARD	1	DM3000-23A ASSY
10	301400001	Hinge TH-134-3A	1	
11	607308140	Hinge Base	1	
12	393230052	Spacer BSB-305-5	4	



No.	Part No.	Description	QTY	Remarks
1	607304120	Hinge Cover	1	
2	607308170	Monitor Coin Screw	2	



7.2.7 Other parts

Standard Accessories (GL1000)

No.	Part No.	Description	QTY	Remarks
1	500051394	AC adapter PW-070A-1Y24D0 (Overseas)	1 to 2	8ch:1, 16ch:2
	500051337	AC adapter RC60-24B (Japanese)	1 to 2	8ch:1, 16ch:2
2	607305000	CD-ROM User's guide GL1000-CDM01	1	
3	607305020	Quick start guide GL1000-UM-Q01.A1	1	Standard Model (Japanese)
	607305030	Quick start guide GL1000-UM-Q51.A1	1	Standard Model (English)
4	607305040	Quick start guide GL1000-UM-Q01.B1	1	With monitor (Japanese)
	607305050	Quick start guide GL1000-UM-Q51.B1	1	With monitor (English)
5	607305060	Software installation manual GL1000-UM-901	1	(Japanese)
	607305070	Software installation manual GL1000-UM-951	1	(English)

Standard Accessories (GL1100)

No.	Part No.	Description	QTY	Remarks
1	500051394	AC adapter PW-070A-1Y24D0 (Overseas)	1 to 2	8ch:1, 16ch:2
	500051337	AC adapter RC60-24B (Japanese)	1 to 2	8ch:1, 16ch:2
2	607305000	CD-ROM User's guide GL1000-CDM01	1	
3	607305080	Quick start guide GL1100-UM-Q01.A1	1	Standard Model (Japanese)
	607305400	Quick start guide GL1100-UM-Q51.A1	1	Standard Model (English)
4	607305090	Quick start guide GL1100-UM-Q01.B1	1	With monitor (Japanese)
	607305410	Quick start guide GL1100-UM-Q51.B1	1	With monitor (English)
5	607305060	Software installation manual GL1000-UM-901	1	(Japanese)
	607305070	Software installation manual GL1000-UM-951	1	(English)

Monitor Accessories

No.	Part No.	Description	QTY	Remarks
1	690630031	Control Cable DM3000-03A	1	70 mm

Printer Accessories

No.	Part No.	Description	QTY	Remarks
1	690630042	Printer Cable DM3000-04B	1	
2	500051394	AC adapter PW-070A-1Y24D0 (Overseas)	1	
	500051337	AC adapter RC60-24B (Japanese)	1	
3		Recording Paper	1	

Logic AMP Accessories

No.	Part No.	Description	QTY	Remarks
1	237600020	Alligator Clip Cable	2	
2	237600030	IC Clip Cable	2	
3	237600080	Logic Cable	2	
4	076005280	Label for Logic Amp	2	

12 VDC option Accessories

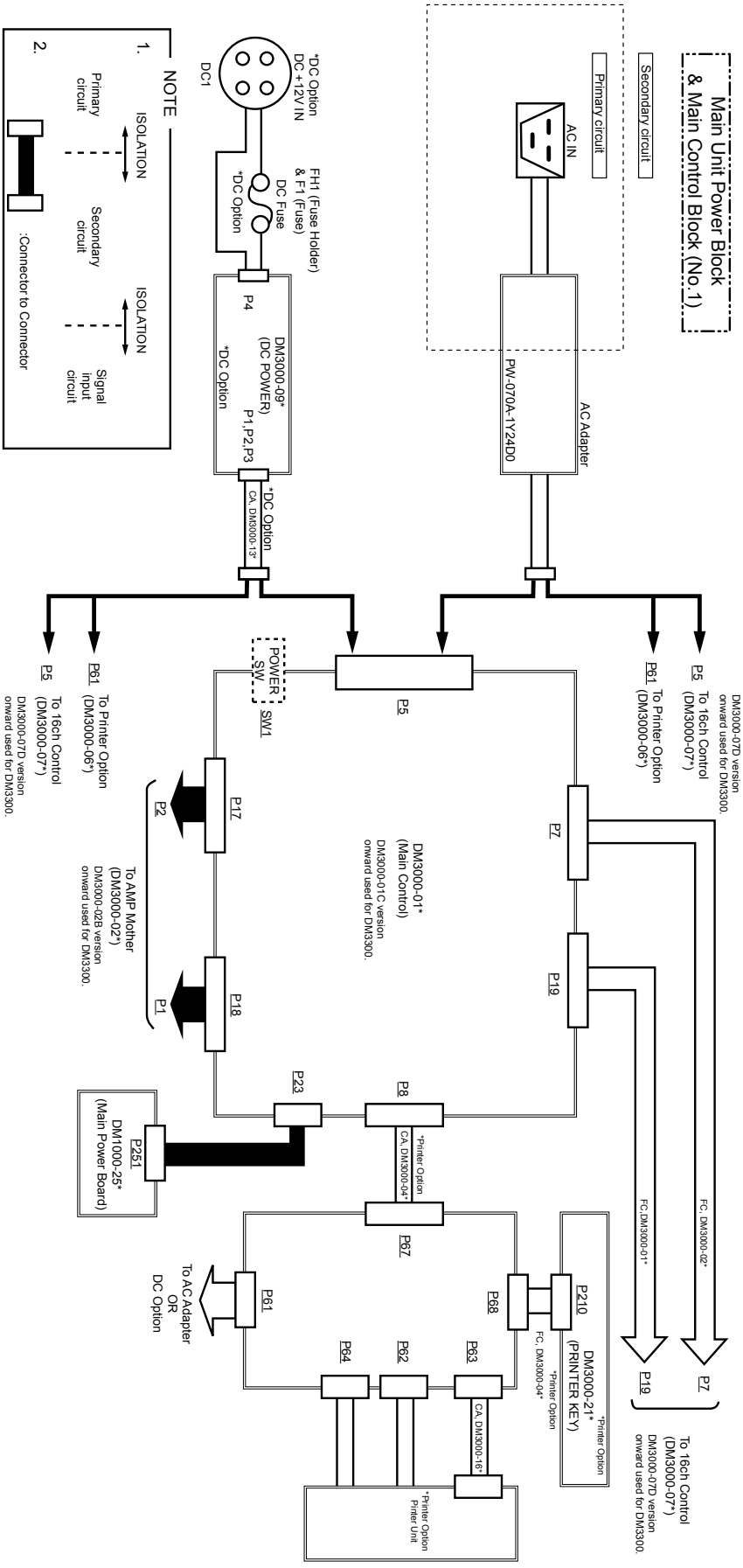
No.	Part No.	Description	QTY	Remarks
1	500002591	Fuse, 326 020	1	20 A fuse
2	690803351	DC Input Cable, WR9000-35A	1	
3	690630120	DC Output Cable, DM3000-12	3	

Option Cables

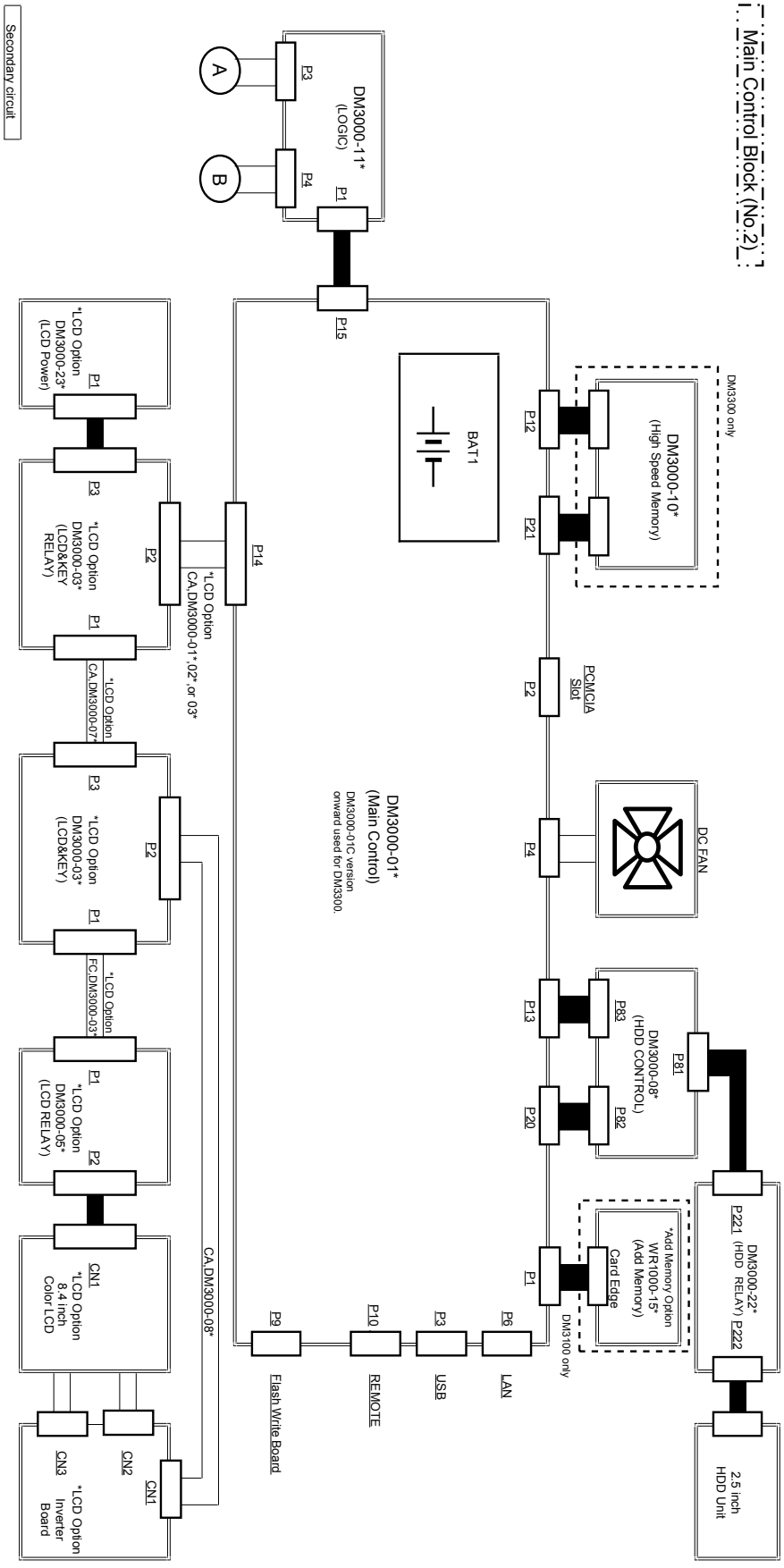
No.	Part No.	Description	QTY	Remarks
1	690630011	Option Monitor Cable, DM3000-01A	1	225 mm length
2	690630021	Option Monitor Cable, DM3000-02A	1	1000 mm length
3	690630051	Synchronized input Cable, DM3000-05A	1	GL1000 only (B-508)

8. Block Diagrams

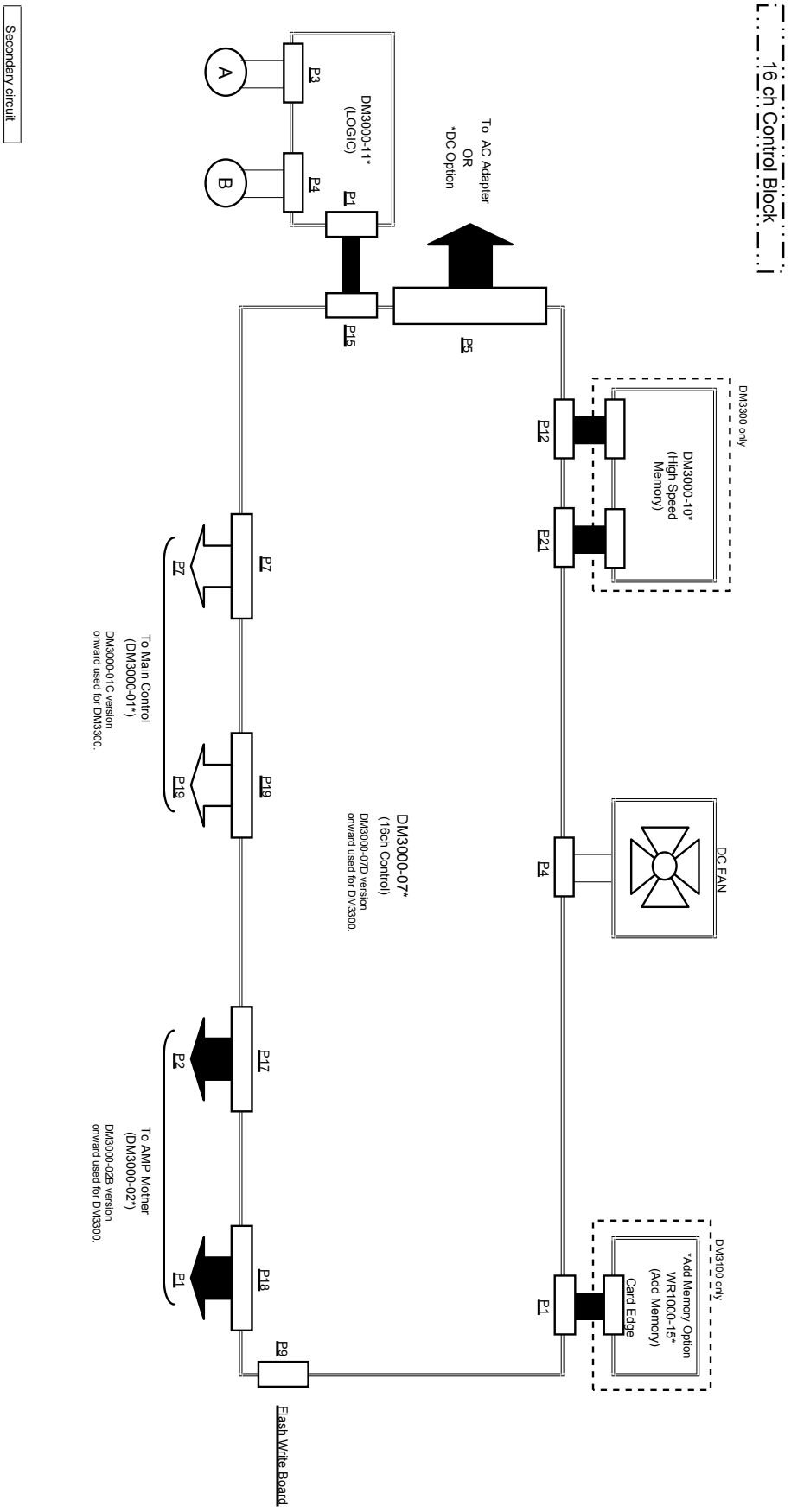
8.1 Main Unit Power and Main Control Block



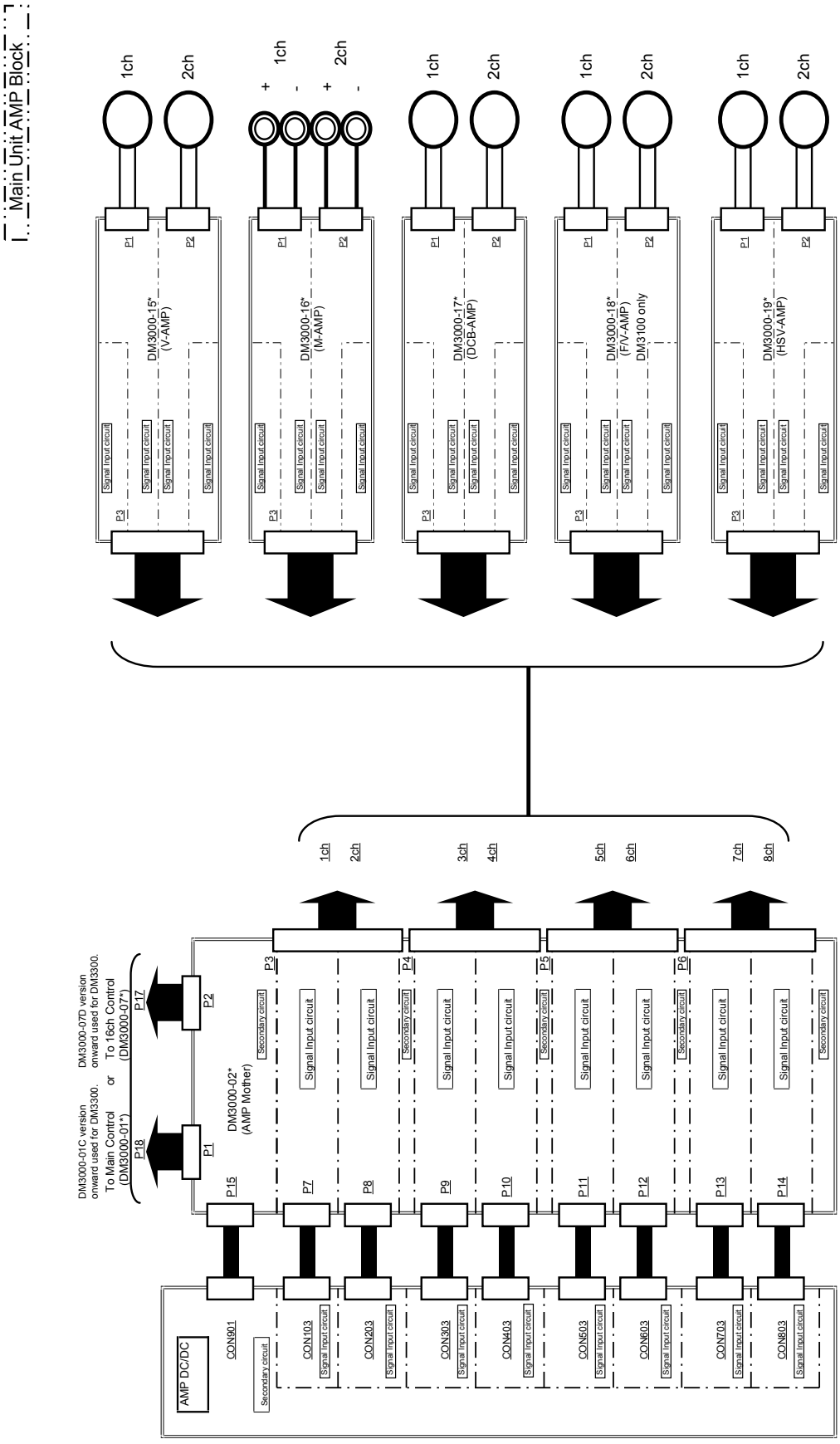
8.2 Main Control Block



8.3 16-Ch Control Block



8.4 Main Unit AMP Block



8.5 Details of AMP Block